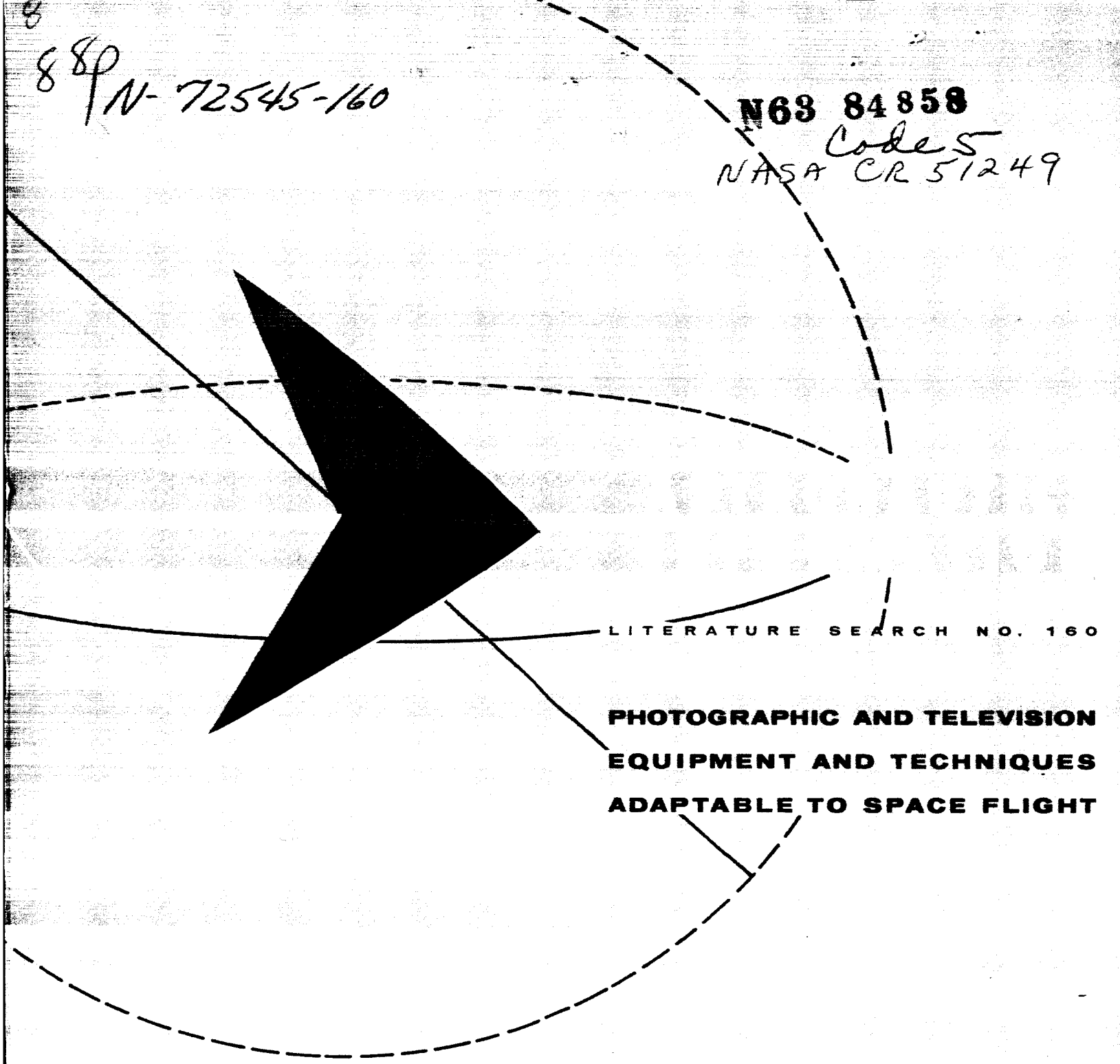

LITERATURE SEARCH NO. 160

PHOTOGRAPHIC AND TELEVISION EQUIPMENT AND TECHNIQUES ADAPTABLE TO SPACE FLIGHT

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY

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National Aeronautics and Space Administration
(NASA Contract No. NASw-6)

ASTRONAUTICS INFORMATION

LITERATURE SEARCH NO. 160

PHOTOGRAPHIC AND TELEVISION EQUIPMENT AND TECHNIQUES ADAPTABLE TO SPACE FLIGHT

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JET PROPULSION LABORATORY
California Institute of Technology
Pasadena, California
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FOREWORD

In order to design an image-reproducing unit to be used in a space vehicle, information was requested on the following aspects of television and photography:

Airborne Photography. Many types of airborne cameras with various applications are reviewed. Material on the development of aerial photography and photogrammetry is included, with special emphasis on cameras and techniques; however, material on mapping and terrain recognition have been omitted.

High-Speed Cameras. The development of high-speed cameras in the millisecond range is reviewed, as well as accessories to these cameras, i.e., shutters and lenses. Ultra-high speed methods in the microsecond range such as image converters and rotating mirrors have not been included.

Astronomical Photography. Cameras and methods used for astronomical observations are included when applicable.

Television Development. Early writings on television and articles dealing with its history and development are included as possible sources of information on the older mechanical systems of television. There is additional material on modern television developments and applications of interest to spaceflight.

Television Scanning Systems. Emphasis is placed on mechanical scanning systems, and most of this section deals with the "flying-spot scanner."

Television Bandwidth Control. This material covers methods of reducing bandwidth while retaining maximum efficiency.

Television Cameras. In this search emphasis is given to the vidicon camera because of its compact size and greater sensitivity. Other types of cameras are included if pertinent application is mentioned.

Magazine articles are listed in chronological order by year within each subject category. These are followed by reports in alphabetical order by source, and books in alphabetical order by author.

This search is unclassified, and classified reports have been included only when the title and abstracts are unclassified, according to the ASTIA Technical Abstracts Bulletin.

The following sources have been consulted: JPL Book file; JPL Library Additions; JPL Source file; ASTIA files; Astronautics Information Abstracts, Volume I, Parts A, B, and C; ASTIA TAB (to U59, #12); Publishers Guide to Books in Print; *Physics Abstracts* (*PA*), 1931–1949, 1953–1958; *Electrical Engineering Abstracts* (*EEA*), 1936–1952, 1954–1957; *Engineering Index* (*EI*), 1920–1957; *Industrial Arts* (*IA*), 1956–1957; Applied Science and Technology (AS&T), January 1958–October 1959.

PREFACE

The technical staff of the Jet Propulsion Laboratory library is engaged in an extensive literature searching program covering subjects selected by the Laboratory engineers and designed to meet their individual needs. Searches considered to be of interest to persons working in the field of astronautics will be published for distribution to interested organizations.

CONTENTS

I. AIRBORNE PHOTOGRAPHY

A. Periodicals

1. ALL PURPOSE AERIAL CAMERA
Airway Age, v. 11, no. 1, p. 65, January 1930

A description of the model F-4 camera which will take vertical and oblique pictures at any distance from 8 ft up.

2. SHOT FROM THE SKY
Sheinert, C. A.
Western Flying, v. 7, no. 2, pp. 66–68, February 1930

Practical experiences in aerial photography and a description with details of the equipment used.

3. NEW PHOTOGRAPHIC EQUIPMENT FOR AIR FORCES
Orselli
Revue des forces Aériennes, no. 11, pp. 696–708, June 1930

4. AIR PHOTOGRAPHY
Laus, F. C. V.
RAF Quarterly, v. 1, no. 3 and 4, pp. 524–533, July 1930; pp. 694–704, October 1930

Methods and equipment for aerial photography used by the RAF (July); data on weight and dimensions of cameras; procedure of making exposures; development and printing. (October)

5. AERIAL CAMERAS AND PHOTOGRAPHY
Cairns, J. R.
The Engineering Journal, v. 14, no. 5, pp. 297–303, May 1931

Equipment and methods for oblique and vertical aerial photography.

6. SURVEYING WITH 5-LENS CAMERA
Bagley, J. W.
Military Engineering, v. 24, no. 134, pp. 111–114, March-April 1932

7. DETERMINATION OF DISTORTION IN NUMBER OF AIR CAMERAS LENSES
Field, R. H.
Canadian Journal of Research, v. 10, no. 2, pp. 239–243, February 1934

8. MULTI-LENS CAMERA FOR AERIAL MAPPING
Engineering News Record, v. 117, no. 18, p. 617, October 29, 1935

A camera is described with nine lenses, eight mirrors.

9. AERIAL PHOTOGRAPHY
Talley, B. B.
Mechanical Engineering, v. 58, pp. 151–156, March 1936

Discusses the technique of obtaining good aerial photographs dealing with the necessary cooperation between pilot and photographer, the type of camera to be used and films available, exposure time, lens and shutter speeds, filters and development time. (*PA*, 1936)

10. PRECISION CAMERA FOR TESTING LENSES
Gardner, I. C., Case, F. A.
Journal of Research of the National Bureau of Standards, v. 18, pp. 449–460, April 1937

Apparatus particularly adapted to the testing of aeroplane camera lenses and complete aeroplane cameras is described. Seven collimators provide optical distant targets spaced five degrees. These targets are photographed by means of the lens or camera to be tested. An examination and measurement of the resulting negative gives the back focal length, equivalent focal length, and both distortion and quality of definition over the entire field of the lens. This instrument was designed and built for making the tests that are required by all contracts for government mapping projects. (*PA*, 1937)

11. NEW WIDE-ANGLE AERIAL-SURVEY CAMERA
Furbank, A.W.
American Institute of Mining and Metallurgical Engineer, Technical Publication 952, Meeting, February 1938

12. PILOT BALLOON THEODOLITE
Cranna, R.
Journal of the Royal Meteorological Society, v. 64, pp. 613–615, October, 1938

The types of pilot balloon theodolite used are all based on that designed by de Quervain in 1905. The features of

the two main types hitherto used at the meteorological office outstations are described. The present instrument has been built to incorporate the desirable features of the two types and to improve upon any shortcomings common to both. The remodeling of the mechanical system which is fully described has simplified the illumination of the theodolite necessary for night ascents. (*PA*, 1938)

13. UNIQUE AERIAL CAMERA BEING TESTED BY RCAF
Canadian Aviation, v. 11, p. 8, November 1938

14. METALS AND ALLOYS IN AERIAL CAMERAS
Cone, E. G.
Metals & Alloys, v .10, no. 2, pp. 34–41, February 1939

15. CAMERA ERROR IN PHOTOGRAMMETRIC MAPPING
Gardner, I. C.
Journal of Research of the National Bureau of Standards, v. 22, pp. 209–238, February 1939

Some of the errors in a map constructed from aeroplane photographs arise from differences between the actual performance of the camera and the postulated performance as defined by the calibration constants. The different sources of errors of this nature are enumerated and equations are derived showing the relation between errors in the calibration constants of the camera and the resulting errors in the map. Equations are given for resulting errors in the map arising from incorrect value of the calibrated focal length, distortion, and incorrect location of the principal point. Other sources of error in the camera, such as failure of the film to lie in a plane, the character of performance of the shutter, and imperfect filters are considered and their effects upon the image evaluated. (*PA*, 1939)

16. RECENT IMPROVEMENTS IN TECHNIQUE OF AERIAL PHOTOGRAPHY
Bruce, H. T.
Petroleum Engineering, v. 10, no. 8 and 9, pp. 31–32, May 1939; pp. 141–142, June 1939

17. RECENT DEVELOPMENT IN THE SURVEYING INSTRUMENTS
Macleod, M. N.
Proceedings of the Physical Society, London, v. 51, pp. 710–732, July 1939

Surveys recent optical developments of interest either because of novelty or because of importance to the surveyor. The main subjects discussed are theodolites and air photography. In connection with the cameras, lenses, plotting apparatus, automatic plotting machines and comparators are dealt with. (*PA*, 1939)

18. AERIAL PHOTOGRAPHY GROWS UP
Bruce, H. T.
Engineering and Mining Journal, v. 141, no. 3, pp. 48–51, March 1940

A general commentary is given on progress made during the last 25 years.

19. SKY EYE
Martin, D.
Minnesota Techo-log, v. 21, no. 7, pp. 158–159, April 1941

20. FLIEGERKAMMERN DER FIRMA WILD, HEERBRUGG
Wieland, D.
Schweitzer Aeronautical Review, v. 16, no. 5, pp. 25–26, May 1941

A description of the aerial photography camera built by Wild, Heerbrugg, which incorporates new triple control mechanisms driven by constant speed motor built in housing, is given.

21. NEW WIDE ANGLE AERIAL SURVEY CAMERA
Furbank, A. W.
American Institute of Mining and Metallurgical Engineers, Transactions of (Mine Geology), v. 144, pp. 415–422, 426–428, 1941

22. MILITARY USES OF PHOTOGRAPHY FROM AIR
Clark, W., Zarnol, R. R.
Military Engineering, v. 33, no. 191, pp. 357–362, September 1941

23. LENSES FOR AERIAL PHOTOGRAPHY
Kingslake, R.
Journal of the Optical Society of America, v. 32, no. 3, pp. 129–134, March 1942

24. ELECTROPLANE CAMERA
Electronics, v. 15, no. 3, pp. 44–47, March 1942

25. AIR PHOTOGRAPHY IN WAR
Laws, F. C. V.
Flight, v. 1757, pp. 229–232, August 27, 1942

Notes on the development of RAF's F.24 camera with wide variety of duties; mid-air processing, cine-camera gun.

26. CHARACTERISTICS OF WIDE-ANGLE AIRPLANE CAMERAS LENSES
Washer, F. E.
Journal of Research of the National Bureau of Standards, v. 29, no. 3, pp. 233–246, September 1942

27. AERIAL PHOTOGRAPHIC EQUIPMENT
Hoffman, H. J.
Ohio State University, Engineering Experiment Station News, v. 15, no. 3, pp. 21–22, June 1943

28. AERIAL CAMERAS
Oates, J. A.
Aircraft Production, v. 5, no. 56, pp. 280–289, June 1943

29. INSTRUMENT CAMERA FOR AIRCRAFT
Field, R. A.
Canadian Journal of Research, v. 22, Sec. F, no. 2, pp. 29–33, March 1944

30. FAIRCHILD TELLS PROBLEM OF AIR CAMERA MAINTENANCE
Western Flying, v. 24, no. 8, p. 98, August 1944

31. RECENT ADVANCES IN PHOTOGRAPHIC TECHNIQUE
Baines, H.
Society of Chemical Industry, Eng., no. 40, pp. 346–350, September 30 and October 7, 1944

Some outstanding developments including high-speed photography, air photography, photographic emulsions, and plates, are reviewed.

32. AERIAL CAMERA MAINTENANCE
Aero Digest, v. 47 no. 6, pp. 100, 226, December 15, 1944

33. REGION OF USABLE IMAGERY IN AIRPLANE-CAMERA LENSES
Washer, F. E.
Journal of Research of the National Bureau of Standards, v. 34, pp. 175–198, February 1945

The proper placing of a lens with respect to the focal plane in a fixed-focus camera is governed by quality of imagery, depth of focus at a given stop opening, and curvature of field. There is good agreement between observed depth of focus at a given stop opening and that predicted on the basis of geometric optics. Observed values of the maximum resolving power at various angular separations from the axis are generally lower at the larger stop openings than values predicted on the basis of physical optics. This lowering is a consequence of residual aberrations, inherent in an actual lens, which are more noticeable at large aperture ratios. A method of presenting the resolving-power characteristics throughout the range of useful imagery in the form of sets of master curves has been developed. These curves show at a glance the variation of resolving power with distance from the plane of best axial imagery, the depth of focus for any observed value of the resolving power, the effect of field curvature on imagery in any given image plane, and the differing performance for tangential and radial imagery at various angular separations from the axis. Successive groups of these master curves show how variations in stop opening affect the performance of a lens. (*PA*, 1945)

34. AIR CAMERA DESIGN
Williamson, S.
The Photographic Journal, Section B, v. 85, pp. 50-56, May–June 1945

Modern requirements for war purposes and for peacetime surveying. Operational limitations such as haze, altitude, low temperature and humidity, vibration, drift and the effect of violent changes in velocity are discussed and current trends regarding choice of picture sizes, magazines, methods of holding the film flat, shutters, methods of simultaneously photographing relevant aircraft instruments, and lenses and their mountings are reviewed. (*PA*, 1946)

35. OSC-1 AIR SURVEY CAMERA
Flight, v. 48, no. 1908, p. 89, July 28, 1945; also *Aeroplane*, v. 69, no. 1783, p. 96, July 27, 1945

36. EFFECTS OF TEMPERATURE AND PRESSURE ON THE FOCUS OF AERIAL CAMERAS
Woodford, E. B., Nierenberg, R. N.
Journal of the Optical Society of America, v. 35, pp. 619–22, October 1945

Temperature and pressure effects should be considered in the design and use of aerial cameras having long focal length lenses. There are two aspects to the problem of correcting for temperature: change in flange focus caused by a temperature change; and loss in definition where there are temperature gradients within the optical system. Compensation for the former can be achieved by adjusting the focus of the lens of the camera for the temperature at which it is to be used. The only solution for the latter is to maintain the lens at a uniform temperature for considerable time prior to use (for example, 3 hours for the 40-inch $f/8$ telephoto lenses), and at the same temperature during use. This may be accomplished by suitable insulation and adequate, thermostatically-controlled heating. (*PA*, 1946)

37. BEGINNINGS OF PHOTOGRAPHIC RECONNAISSANCE
Hemming, H.
Aeroplane, v. 70, no. 1807, pp. 53–55, January 11, 1946

38. THE TELERAN PROPOSAL
Herbst, P. J., Wolff, I. Ewing, D., and Jones, L. F.
Electronics, v. 19, pp. 124–127, February 1946

A system of aircraft navigation and traffic control combining television and radar. (Television Radar Air Navigation.) Radar presentations of the sky above the airfield, determined by ground-based microwave radars, are shown on plan position indicators and viewed by television cameras. Maps of the area and other data are superimposed and the combined picture transmitted to incoming aircraft which carry coded radar beacons and television receivers. Experiments have shown that the scheme is flexible and comprehensive. (*EEA*, 1946)

39. HIGH SPEED PHOTOGRAPHY OF THE CATHODE-RAY TUBE
Goldstein, H., Bales, P. D.
Review of Scientific Instruments, pp. 89–96, March 1946

Some techniques are described that have been developed for the periodic recording of single, fast traces on a cathode-ray tube at rates up to 4000/sec. The factors affecting the maximum writing speed are discussed and it is shown that speeds as high as 70cm/sec can be obtained without sacrifice of deflection sensitivity and using commercially available tubes and films. Several 16mm cameras—adaptations of existing models—which permit photography of as many as 4000 traces/sec are described. The film in these cameras moves continuously and at high speeds and cannot normally be projected as a moving picture. Where such projection is desired, a camera is employed which provides trigger pulses to initiate the transients synchronously with the film speed. Finally, a technique is presented for placing consecutive identification numbers in each frame area. (*PA*, 1946)

40. PHOTOGRAPHIC RESOLVING POWER
Howlett, L. E.
Canadian Journal of Research, Section A, v. 24, pp. 15–40, July 1946

The nature of photographic resolving power is discussed and attention called to the widespread misconception of it that exists at the present time. An annulus type of target is proposed as more suitable for testing than line targets. A method is given for the selection of the photographic focal plane when the essential requirement of the photographic use is the acquisition of maximum information. Results are presented on a study of a number of well-known types of photographic objectives used for aerial photography. (*PA*, 1947)

41. WILLIAMSON OSC-1 AIR CAMERA
Flight, v. 50, no. 1962, p. 123, August 1, 1946

42. AERIAL CAMERAS
Abrams, T.
Mechanical Engineering, v. 68, no. 10, pp. 866–870, October 1946

43. THE PERFORMANCE OF AIRCRAFT CAMERA LENSES
Selwyn, E. W. H., Tearle, J. L.
Proceedings of the Physical Society, London, v. 58, pp. 493–525, September 1946

For quantitative considerations it is necessary to adopt a measure of the detail-revealing capacity of the negatives, and for this purpose the resolving power was chosen.

Careful choice of a test-object was necessary, for different test-objects gave different results. A test-object consisting of sets of two rectangles separated by their width, with a difference in density of 0.2 (brightness ratio 1.6:1) between them and the background, was adopted. A figure for the performance of any lens was obtained by averaging the resolving power over the field of the lens, having regard to the greater area covered at the larger angles. It could be represented with very fair accuracy by the formula

$$R = \left(\frac{207}{f.G}\right)^{1/2} \cdot \left(\frac{F.\ No.}{\tan^2 \theta}\right)$$

where R is the mean resolving power in lines per mm over the field up to an angular distance θ from the axis, f is the focal length of the lens in inches, and $F.\ No.$ its relative aperture. G is the granularity of the film in density-microns at a density of 1.0. This formula has no substantial theoretical basis, although it can be accounted for to some extent. (*PA*, 1946)

44. RECENT DEVELOPMENTS IN LENSES FOR AERIAL PHOTOGRAPHY

Kingslake, R.

***Journal of the Optical Society of America*, v. 37, no. 1, pp. 1–9, January 1947**

Wartime development traced, with special reference to progress in United States; mapping and survey lenses; night photo lenses; reconnaissance lenses, photographic airplanes; strip camera; limit in resolving power of aerial camera, and focusing of large aerial lenses. (*EI*, 1947)

45. SPACE RESECTION PROBLEMS IN PHOTOGRAMMETRY

Underwood, P. H.

***American Society of Civil Engineers, Proceedings of the*, no. 1, pp. 89–93, January 1947; no. 5, pp. 718–720, May 1947; no. 6, pp. 904–906, June 1947.**

46. LENSES OF EXTREMELY WIDE ANGLE FOR AIRPLANE MAPPING

Gardner, I. C., Washer, F. E.

***Journal of Research of the National Bureau of Standards*, v. 40, pp. 93–103, February 1948**

If the illumination of the image produced by a wide angle lens covering a field of 120 deg follows the $\cos^4$ law, the illumination at the edge of the field will be 1/16th that at the center in the absence of vignetting. By introducing negative distortion, the illumination may be expected to be more uniform from the center to the edge of the field. In particular, if there is no vignette, and if the diaphragm precedes the lens, there will be uniform illumination, even for a field as great as 180 deg, if the distortion is such that $r' = f \sin\beta$, where r' is the distance from center of the field to a given image point, β is the corresponding angular distance from the axis in the object space, and F is the focal length corresponding to the part of the image in the neighborhood of the axis. Detailed results of tests on a German Pleon mapping lens and a rectifying unit are given. The lens covers a field of 130 deg, and the distortion closely follows the law $r' = f\beta$ (somewhat less than that of the preceding formula). Measurements of the resolving power, of the effective size of the entrance pupil for different angular distances from the axis, and of the net distortion of the two systems are reported. In a final print there is significant residual distortion resulting from the failure of the distortions of the two systems to annul each other exactly. (*PA*, 1948)

47. EXPERIMENT IN SUPERSONIC AERIAL PHOTOGRAPHY

Keogh, A. D.

US Air Force, Air Technical Intelligence, *Technical Data Digest*, v. 12, no. 10, pp. 11–14, November 15, 1947

Tests made to check capability of existing aerial camera, developed by Air Material Command, to secure reconnaissance photographs from low flying supersonic aircraft. Results were satisfactory; photographs taken at relative speeds of 1000 mph were reproduced. (*EI*, 1948)

48. CHOOSING AN EMULSION AND PROCESSING TECHNIQUE FOR DAYLIGHT AERIAL PHOTOGRAPHY

Howlett, L. E.

***Canadian Journal of Research*, Section A, v. 26, pp. 60–64, March 1948**

Experiments are reported that show the relations existing between γ, useful exposure range for aerial photography, maximum resolving power, and emulsion speed as

determined by the resolving power criterion. The results are used to deduce the proper choice of emulsion and processing technique for ordinary daylight aerial photography where the main requirement is the acquisition of information. (*PA*, 1948)

49. AERIAL PHOTOGRAPHIC EQUIPMENT AND APPLICATIONS TO RECONNAISSANCE

Katz, A. H.

***Journal of the Optical Society of America*, v. 38, pp. 604–610, July 1948**

This paper covers briefly some of the photographic equipment and applications in use by the US Air Force, with emphasis on reconnaissance photography. Three main divisions of effort are defined: reconnaissance, mapping, and the dual field of photographic instrumentation and instrumentation photography. A heuristic equation is given to demonstrate the usefulness of long focus lenses, and the development of the long focus lenses, shutters, and performance tests is described. Shutterless strip cameras and moving film magazines are now in use, utilizing image motion compensation. Remarkable photographs have been made under extreme ground speed and low illumination conditions. New developments in mounts, lenses, cameras, and shutter are described, including the 111-in. *f*/10 figure 4 camera, the 48-in. *f*/6.3 camera featuring a novel high-speed louvre shutter, and two extremely wide-angle spherical focal plane cameras. The function of night photographic reconnaissance is discussed, and two night photographic systems described. (*PA*, 1948)

50. STABILIZED CAMERA MOUNT IN AIRCRAFT

Keogh, A. D.

US Air Force, Air Technical Intelligence, *Technical Data Digest*, v. 13, no. 19, pp. 13–19, October 1, 1948

Effects of centrifugal force and of Coriolis force; mechanical eccentricities of oscillation and "hunting"; factor labeled "stiction" is encountered at low speeds and in devices supposed to indicate point with accuracy; "stiction" will stop indicator short of perfect zero, and, because of static friction and backlash in parts, will give reading which is never quite correct; design and application of gyro-based stabilizing system for aerial cameras. (*EI*, 1948)

51. CAMERA SHUTTERS

Katz, A. H.

***Journal of the Optical Society of America*, v. 39, pp. 1–21, January 1949**

The characteristics of between-lens, focal-plane and louvre shutters are reviewed, and the important distinction between effective exposure time and actual (or motion-stopping) exposure time is clarified. The oscillographic test method for between-lens shutters is described and depicted via photograph and schematic diagram. The effect of inefficient between-lens shutters on optical performance, effect of a glass pressure plate on efficiency of focal-plane shutters, and equations for the two types of distortion caused by focal plane shutters are discussed. The utilization and advantage of shutter speed in aerial cameras to reduce the deteriorative effects upon definition caused by forward aircraft speed, angular motion of the aircraft about its axis, and camera vibration are considered. The shutterless strip camera and the corollary principle of image speed compensation with moving-film magazines in conventional cameras, and the potentialities of this important new development, are described. A list of seventeen memorandum reports, which cover in detail the work summarized in this paper, is appended. (*PA*, 1949)

52. VEILING GLARE IN AERIAL PHOTOGRAPHY

Baird, K. M.

***Canadian Journal of Research*, Section A, v. 27, no. 4, pp. 130–142, July 1949**

Experimental results showing effect of glare on resolving power of standard aerial film presented in form of graphs. Method of measurement; typical amounts encountered in widely used aerial cameras; veiling glare commonly causes loss of photographic speed of as much as 100%; recommendations made for minimizing glare in cameras. (*EI*, 1949)

53. NEW LENS OF HIGH OPTICAL PERFORMANCE FOR AERIAL PHOTOGRAMMETRY

Bertele, L.

***Photogrammetrica*, v. 1, no. 2, pp. 52–53, 1949**

54. L'AEROTOPOGRAPHIE MODERNE ET SES APPLICATIONS

Ansermet, A.

***Bulletin Technique de la Suisse Romande*, v. 75, no. 19, pp. 240–242, September 10, 1949**

Modern aerial photography and its applications; description of Wild RC7 camera; use of amplifier, rectifier and other equipment. (*EI*, 1950)

55. PHOTOGRAMMETRIC ERRORS FROM CAMERA LENS DECENTERING
Carman, P. C.
***Journal of the Optical Society of America*, v. 39, no. 11, pp. 951–954, November 1949**

Mathematical study of distortion introduced by thin prism associated with perfect lens of 6-in. focal length covering 9x9-in. negative; position of principal point for minimum distortion is found to lie away from two currently used. (*EI*, 1950)

56. PRELIMINARY REPORT ON HIGH-ALTITUDE PHOTOGRAPHY
Holliday, C. T.
***Photographic Engineering*, v. 1, no. 1, pp. 15–26, January 1950**

Instrumentation, film, and camera recovery after rocket landing; photographic techniques, quality of results, and summary of tests with camera installed in V-2 and Aerobee rockets. (*AEI*, 1951)

57. AIR-BORNE SYNCHRONIZED MOTION PICTURE CAMERA RECORDING SYSTEM
White, V. J., Horwitz, S. J.
***Electrical Engineering*, v. 69, no. 4, pp. 324–327, April 1950**

Camera motor control system developed to take 20 frames of movies film per sec and keep cameras synchronized to within 0.002 sec; driving system used pulses from 1200-rpm shaft to synchronize series d-c motors running at 3600 rpm; second group of cameras in remote aircraft can be operated by radio signals from parent aircraft. (*EI*, 1950)

58. AUTOMATIC EXPOSURE CONTROL
Bruck, G., Higgins, J., Ward, J.
***Electronics*, v. 23, no. 5, pp. 74–78, May 1950**

Since aerial photography above 600 mph under varying lighting conditions demands compromise in camera settings, system was devised whereby photoelectric servo control of iris aperture provides optimum exposure; camera used is modified US Air Force Model S-7 with stereoscopic lenses and open, slit type shutter circuit details. Applicability to motion picture and television cameras. (*EI*, 1950)

59. FOUR CAMERAS FOR RESEARCH IN THE AERONAUTICAL FIELD
St. Thomas, J.
***Photographic Engineering*, v. 1, no. 3, pp. 76–93, July 1950**

Cameras for aircraft takeoff and landing, automatic flight data, and cockpit visibility.

60. TECHNIQUES AND RESULTS OF AEROMAGNETIC SURVEYING
Balsey, J. R.
***Shell Aviation News*, no. 147, pp. 15–17, September 1950**

61. CONTRIBUTION TO THEORY OF ERRORS FOR DOUBLE POINT INTERSECTION IN SPACE
Hallert, B.
***Kungliga Tekniska Hogskolans Handlingar*, Nr. 35, 1950, *Acta Polytechnica*, Stockholm, no. 667; *Physical and Applied Mathematics Series*, v. 1, no. 8, 1950. (in English)**

Review of the fundamental principle and practical application of double point intersection; method of least squares and its application to double point intersection in space; mean error of standard observation in adjustment of vertical parallaxes; weight distribution. (*AEI*, 1951)

62. PHOTOGRAPHIC DETERMINATION OF THE ORIENTATION OF A ROCKET
Frazer, L. W., Ostrander, R. S.
***Photographic Engineering*, v. 1, no. 4, pp. 5–18, October 1950**

The position of the camera in space can be determined from a photograph that contains two or more identifiable landmarks. The orientation of the rocket is derived by means of a model that contains the fixed angular relationship of the camera to the rocket in which it is mounted. (*AEI*, 1951)

63. DESIGN CONSIDERATION FOR LARGE AERIAL CAMERAS
Macdonald, D. E.
Journal of the Society of Automotive Engineers, v. 58, no. 10, p. 66, October 1950

Problems of vibration and air turbulence; importance of placement and mounting of camera stressed. (*EI*, 1950)

64. HIGH ALTITUDE LABORATORIES
Korff, A. A.
Physics Today, v. 3, no. 11, p. 17–23, November 1950

Survey of existing high altitude research laboratories at 5000 ft and above and of yet unexploited sites where high altitude laboratories of future might profitably be established; usefulness in cosmic ray research, coronographic studies, meteorology, glaciology, radio wave propagation investigations, long distance photography, and other fields of science. (*EI*, 1950)

65. PHOTOGRAPHY OF HIGH ALTITUDE AERIAL OBJECTS
Nelson, C. N., Hamsher, D. H.
Journal of the Optical Society of America, v. 40, no. 12, pp. 863–877, December 1950

Problem of photographing objects at altitudes of 15,000 ft and higher from ground. Advantages of long focal length lenses, high contrast film, and special color filters; data regarding adjustment of controllable factors to obtain maximum image contrast sensitivity; data on optimum reflectance characteristics of targets for special purposes; stereo analysis by use of pair of films in widely spaced cameras. (*EI*, 1951)

66. PRACTICE AND APPLICATION OF AERIAL SURVEYING
Dawe, H. G.
Journal of Institution of Municipal Engineers, v. 77, no. 8, pp. 641–650, February 1951

Data on oblique and vertical types of photograph and cameras; description of methods. (*EI*, 1951)

67. ENGINEERING PHOTOGRAMMETRY
Ghaswala, S. K.
Civil Engineering, London, v. 46, no. 539, 540, pp. 352–354, May 1951; pp. 432–434, June 1951

May: Practical applications of photogrammetry; principles of terrestrial and aerial photogrammetry. June: Stereo-photogrammetry; interpretation of aerial photographs. Bibliography. (*EI*, 1951)

68. FURTHER DEVELOPMENTS IN AUTO-EXPOSURE CONTROL FOR AERIAL PHOTOGRAPHY
Bruck, G., Ward, J., Aske, T.
Photographic Engineering, v. 4, no. 4, pp. 182–188, 1952

69. RELIABILITY OF PHOTOELECTRIC PHOTOMETRY
Gridgeman, N. T.
Analytical Chemical, v. 24, no. 3, pp. 445–449, March 1952

Review of the theory of the precision of photoelectric photometry, error sources, statistical analysis, error distribution and precision. (*AEI*, 1952)

70. CURRENT PROBLEMS IN GUIDED MISSILE INSTRUMENTATION
Cobb, H. M.
Photographic Engineering, v. 3, no. 3, pp. 119, 120, 1952

71. PHOTOGRAMMETRY
Criswell, H.
Roads and Road Construction, v. 30, no. 357, pp. 265–272, September 1952

Principle operations of aerial survey; survey of ground control points by ordinary methods, air photography, rectification of photographs and plotting and interpretation; cameras and photographic equipment; revision of existing maps; examples of air surveys made since 1946; application of electronic Airborne Profile Recorder. (*EI*, 1952)

72. AEROBATIC CAMERA
Shell Aviation News, no. 175, pp. 4–8, January 1953

Equipment and methods for obtaining air-to-air aerobatic photographs. (*EI*, 1953)

73. AIR PHOTOGRAPHY
Macdonald, D. E.
Journal of the Optical Society of America, v. 43, no. 4, pp. 290–298, April 1953

Survey of technical aims of air photography and optimization of performance of photo techniques, high microscopic contrast shown to be preferable to high gamma; contrast threshold function is used to evaluate over-all range of image sizes. (*EI*, 1953)

74. PHOTOGRAMMETRY—WHAT IT IS AND HOW IT IS USED
Hammon, A. C.
Western Construction, v. 28, no. 8, pp. 72–74, August 1953

Development of photogrammetry through past 100 years; types of airplanes used for aerial photography; types of aerial mapping cameras and plotting instruments described. (*EI*, 1953)

75. FILM SYNCHRONIZING FOR AERIAL CAMERAS
Meinema, H. E.
Electronics, p. 135, November 1953

76. PRECISE AERIAL CAMERA EXPOSURE CONTROL
Doyle, I. W.
Photogrammetric Engineering, p. 71, March 1954

77. PHOTO INTERPRETATION I, II . . . ENGINEERING APPLICATIONS OF PHOTOGRAMMETRY
Coleman, C. G., Stoneman, W. G., Pryor, P. L., Pennington, J. T.
Photogrammetric Engineering, p. 395, June 1954

Partial contents: "Problems in Getting Information Into and Out of Air Photographs," C. M. Ashchenbrenner; "Interpretation of Radar Scope Photographs," P. R. Hoffman; "An Introduction to Photo Interpretation Problems and Research," B. L. Schatzley and L. S. Karably; "A Systematic Analysis of Some Factors Affecting Photographic Interpretation," R. N. Colwell; "The When, Where, How, and Why of Engineering Applications of Photogrammetry," C. Cottrell. (*AEI*, 1954)

78. PHOTOGRAMMETRIC OPTICS
Photogrammetric Engineering, v. 20, no. 3, pp. 487–510, June 1954

"Introduction," P. L. Pryor; "Russian Photogrammetric Optics," K. Pestrecov; "Problems in Wide Angle Lens Design," J. G. Baker; "Sources of Error in Camera Calibration," F. E. Washer; "Production Control of Factors Affecting Calibration of Photogrammetric Camera," C. L. Norton; "Use of Aspheric Surfaces in Photogrammetric Instruments," J. D. Hayes. (*EI*, 1955)

79. ADVANCES IN GEOLOGICAL SURVEY PHOTOGRAMMETRIC TECHNIQUES
Davey, C. H.
Photogrammetric Engineering, v. 20, no. 4, pp. 701–708, September 1954

US Geological Survey has improved aerial photography in following ways: reconsideration of basic geometry of aerial photography; new lenses and cameras; geological survey camera calibrator; camera mounts; control of aerial film; scientific planning of photography; development of new or improved photogrammetric instruments; techniques and standards. (*EI*, 1954)

80. NEW DEVELOPMENTS IN PHOTOGAMMETRIC EQUIPMENT 1949–1954
Photogrammetric Engineering, v. 20, no. 4, pp. 621–700, September 1954

81. ANNUAL MEETING
Photogrammetric Engineering, v. 21, no. 3, pp. 412–455, June 1955; *American Society of Photogrammetry Papers*, March 7–9, 1955

82. GRID EFFECTS IN AERIAL PHOTOGRAPHY
Kendall, C. W.
Photogrammetric Engineering, v. 21, no. 1, pp. 120–123, March 1955

Grid shaped images, superimposed on aerial photographs, sometimes occur under conditions which are not always predictable; effect shown to be caused by local differences in film sensitivity, associated with complex temperature moisture patterns on emulsion during time of exposure; means of eliminating effect, and precautions which may be taken against it. (*EI*, 1955)

83. PERFORMANCE OF AIR FORCE MAPPING CAMERAS
Crouch, L. W.
Photogrammetric Engineering, v. 21, no. 4, pp. 515–518, September 1955

Cameras which have been used operationally, their relative merits and deficiencies; deficiencies of other components of photo mapping system such as aerial film and aircraft camera window; it is concluded that in order to utilize mapping camera effectively, extreme care must be used in selecting and installing windows and in handling of film. (*EI*, 1955)

84. USAF AERIAL INSPECTION GOES ROBOT
Electronics, v. 28, p. 7, December 1955

Describe the Air Force's use of computers to operate aerial cameras. The method is called the Universal Camera Control System (UCCS), and is being developed by Aerial Research Laboratory (ARDC), A. B. DuMont, and by Fairchild Cameras & Instruments.

85. FLIGHT ANALYZER CAMERA FINDS NEW USES
Aviation Week, v. 62, no. 64, January 31, 1955

86. NEW CAMERA KEEPS PACE WITH SUPERSONIC DEMANDS
Christian, G. L.
Aviation Week, v. 63, pp. 34–35, November 21, 1955

87. THE EFFECT OF ATMOSPHERIC HAZE IN AERIAL PHOTOGRAPHY TREATED AS A PROBLEM IN TONE REPRODUCTION
Tupper, J. L., Nelson, C. N.
Photographic Engineering, no. 2, pp. 116–126, 1955

88. AERIAL SURVEY OPERATIONS
Fleming, J.
Canadian Aeronautical Journal, pp. 148–152, October 1955

89. PHOTOSYSTEMS INSTALLATIONS IN AIRCRAFT
Pallme, E. H.
Photogrammetric Engineering, p. 765–772, December 1955

Fundamental design concepts related to primary mission requirements are discussed.

90. PHOTOGRAPHY FROM THE VIKING II ROCKET
Winkler, L.
Jet Propulsion, pp. 689–695, December 1955

Review of the NRL development and modifications of the airborne research equipment, with methods to calculate the altitude for identification of pictures in terms of the correct pulse. (*AEI*, 1956)

91. ULTRA HIGH-ALTITUDE RECONNAISSANCE CAMERA
Yenner, V. K.
Photographic Engineering, v. 7, nos. 3–4, pp. 204–207, 1956

Requirements of systems and difficulties which have to be overcome to obtain consistently good quality photography from very high altitude supersonic aircraft; possible solutions; it is concluded that camera problems can be solved and that major difficulty at altitudes where atmosphere is still present at significant density may lie in aerodynamic problem of obtaining laminar rather than turbulent air flow through which to photograph. (*EI*, 1957)

92. PHOTO-SYSTEM INSTALLATIONS IN AIRCRAFT
Pallme, E. H.
Photogrammetric Engineering, v. 22, no. 4, pp. 666–673, September 1956

New approach to interpretation of aerial camera lens distortion; curve of distortion based on variations of focal length rather than radial image displacement proposed; simple method described relating height errors in stereoscopic model to lens distortion. (*EI*, 1956)

93. SOURCES OF ERROR IN VARIOUS METHODS OF AIRPLANE CAMERA CALIBRATION
Washer, F. E.
Photogrammetric Engineering, v. 22, no. 4, pp. 727–740, September 1956

Investigation confined to errors affecting measured values of focal length and distortion. Three photographic methods are considered. (*EI*, 1956)

94. STABILIZATION PROBLEMS IN MILITARY AND COMMERCIAL AIRCRAFT
Photogrammetric Engineering, v. 22, no. 4, pp. 646–655, September 1956

"History in Stabilization," E. H. Pallme; "Problems in Military Reconnaissance Requirements and Application of Stabilization to Their Solution," T. Levick; "Design Problems on Twin Camera Mount Using Force Stabilization," W. Stewart; "Integration of Stabilized Mounts into Photo System," I. Doyle; "Problems in Connection with Installing Cameras Inside Pressurized Compartment," R. I. Beck; "New Photo Installation Especially on New High Performance Aircraft," H. Alter. (*EI*, 1956)

95. CAMERA FOR DRONE PHOTOGRAPHY—HYCON HR-216
Morgan, R. A.
***Photographic Engineering*, v. 7, nos. 3–4, pp. 196–199, 1956**

Characteristics of camera, conjointly developed by U.S. Signal Corps Eng. Labs and Battle Area Surveillance Dept; installation on model RP-71 drone aircraft; camera components; image motion compensation; operating data and tactical operation. (*EI*, 1957)

96. INFORMATION THEORY AND ELECTRONIC PHOTOGRAMMETRY
Rosenberg, P.
***Photogrammetric Engineering*, pp. 543–555, September 1956**

Fundamental principles applied to the design of the PRA-TSS system for aircraft scanning of ground points to produce automatically a photomosaic relief model, and a map of any projection from recorded terrain data. (*AEI*, 1956)

97. AERIAL ELECTRONIC SURVEYING
Hunkapiller, B. B.
***Navigation*, pp. 77–83, June 1956**

Discussion of the techniques of aerial surveying using equipment developed from the short-range navigation system (HIRAN). Includes a list of USAF surveying projects throughout the world. (*AEI*, 1956)

98. PERKIN-ELMER AUTOMATIC FOCUSES AERIAL CAMERAS
***Machine Design*, v. 28, pp. 98–99, February 9, 1956**

99. FRONT LINE COMBAT SURVEILLANCE FROM DRONE AIRCRAFT
***Electrical Engineering*, v. 76, p. 943, October 1957**

100. ARMY DRONE CAN TELEVISE ENEMY LINES
***Aviation Week*, v. 65, p. 93, October 8, 1957**

101. DEVELOPMENT OF AERIAL CAMERA STABILIZATION AND ITS EFFECT ON PHOTOGRAMMETRY AND PHOTO INTERPRETATION
Trott, T.
***Photogrammetric Engineering*, v. 23, no. 1, pp. 122–130, March 1957**

Review of the development of stabilizers, ultimate aim of which is to get less than 5 or 6 sec of arc of motion in any exposure period for 36-in. lens. Recent designs using modern gyroscope servo techniques which closely approximate this goal. (*EI*, 1957)

102. HORIZON TO HORIZON CAMERA IS DEVELOPED FOR AIRCRAFT
Christian, G. L.
***Aviation Week*, v. 67, pp. 76–78, September 16, 1957**

103. INTERCONTINENTAL BALLISTIC MISSILE CLOUDS FUTURE OF OPEN SKIES PLAN; AERIAL PHOTO-RECONNAISSANCE DISARMAMENT INSPECTIONS
Cushman, R.
***Aviation Week*, v. 66, pp. 91–92, 9 April 29, 1957**

104. NEW HIGH ALTITUDE STOL HELIO-COURIER BUILT FOR AERIAL PHOTO
Bulban, E. J.
***Aviation Week*, v. 66, p. 101, March 11, 1957**

105. RECONNAISSANCE DRONE; PRESENT WEAPON WITH A FUTURE
Cornelius, G.
***U.S. Naval Institute Proceedings*, v. 83K, pp. 1092–1097, October 1957**

106. SHUTTERLESS AERIAL CAMERA SCANS HORIZON
***Product Engineering*, v. 28, p. 115, September 30, 1957**

107. AIRBORNE OBSERVATORY; PHOTOGRAPHS MADE 80,000 FEET ABOVE THE GROUND BY A 12-INCH TELESCOPE SUSPENDED FROM A GIANT BALLOON
Scientific American, v. 197, pp. 107–108, September 1957

108. RESEARCH AND DEVELOPMENTS IN PHOTOGRAMMETRY
Miller, C. L.
American Society of Civil Engineering, v. 83, SU. 1, no. 1305, pp. 1–11, July 1957

109. STRATO LAB BALLOON PHOTOGRAPHY
Griffin, E. P.
Photogrammetric Engineering, v. 23, no. 3, pp. 582–587, June 1957

A free flight unmanned plastic balloon was used to carry camera about 89,000 ft.

110. SHUTTERLESS AERIAL CAMERA SCANS HORIZON
Product Engineering, v. 28, p. 115, September 9, 1957

111. REQUIREMENTS FOR CAMERAS IN GUIDED MISSILES
Betty, R. M.
Journal of the SMPTE, v. 66, pp. 129–131, March 1957

This is not a technical paper, but a general report on the development of a new field of optical instrumentation, accompanied by a sobering statement of the problems that are still to be solved.

112. A ROCKET AROUND THE MOON
Ehricke, K. A., Gamow, G.
Scientific American, v. 196, no. 6, pp. 47–53, June 1957

113. TO DROP AND FLOAT
Mackie, W. L.
Modern Plastics, v. 34, no. 10, pp. 116–118, June 1957

One phase of flight evaluation of guided missiles consists of launching missiles against targets flown over sea test range; targets are drone aircraft equipped with two detachable wing-tip pods, containing automatic parachutes. Remotely controlled data recording cameras installed in pods photograph space surrounding target and record missile flights; in case of emergency, camera pods are jettisoned and recovered by boats; how cameras are protected by plastic foam. (*EI*, 1957)

114. BALLOON CAMERA GETS A CLOSE-UP OF THE SUN
Aviation Week, v. 67, p. 116, October 28, 1957

115. EARTH SATELLITE PHOTOGRAMMETRY
Rosenberg, P.
Photogrammetric Engineering, v. 24, no. 3, pp. 353–361, June 1958

Photogrammetry of the Earth's surface from satellites, unmanned and manned, is discussed. Orbits, satellite-borne photographic cameras, and environmental conditions are considered. Television and other electronic methods for scanning the ground from a satellite are discussed briefly. It is suggested that the Moon and the planets can be mapped by photogrammetric equipment in satellite vehicles orbitting around these bodies.

116. OPTIGRAPH SYSTEM MAKES IN-FLIGHT STUDY OF AIRPLANE FLEXIBILITY
Industrial Photography, v. 7, pp. 22–23, March 1958

117. FLYING CAMERA STATIONS: PHOTOGRAPHING SURVEYED GROUND MARKERS WITH ONE AERIAL CAMERA
Kinder, F. A.
Journal of the SMPTE, v. 67, pp. 234–237, April 1958

118. UP-IN-THE AIR PHOTOGRAPHY
Brennan, W. X.
Industrial Photography, v. 7, pp. 30–31, June 1958

119. AIRBORNE TELEVISION SYSTEM FOR MILITARY RECONNAISSANCE
Sher, N., Fisher, J. F.
Electronics, v. 31, pp. 66–70, May 23, 1958

This is a description of a frequency-modulated transmitter, operated in 780- to 900-mc frequency band.

120. IT TAKES COMPUTER DATA FROM AIR PHOTOS
Engineering News, v. 161, p. 116, September 18, 1958

121. PHOTOGRAMMETRY, A FEW QUESTIONS ANSWERED
Kelsey, R. A.
Civil Engineering, v. 28, pp. 646–649, September 1958

122. NEW DIRECTIONS IN AIRCRAFT INSTRUMENTATION
Hoover, G. W., et al.
Journal of SMPTE, v. 67, pp. 452–460, July 1958

123. TARGET AIRCRAFT CAMERA
Fairey Review, p. 11, March 1959

This is a description of the design, operation and application of a camera with a field of view of 186 deg.

B. Reports

124. MOTION BLUR IN AERIAL PHOTOGRAPHY PART I. THE INFLUENCE OF SENSITOMETRIC FACTORS ON MOTION BLUR AND MOTION-CAUSED DISTORTION IN AERIAL PHOTOGRAPHS
Nagel, R.
Aerial Reconnaissance Lab., Wright-Patterson AFB, Ohio; Report on Aerial Photo Materials Processes and Techniques, February 1954
WADC TR 54-347
AD 61,910

125. NIGHT AMBIENT LIGHT RECONNAISSANCE SEMINAR SESSION NO. 1. PHOTOGRAPHY HELD AT WADC ON 26 AND 27 JUNE 1957
Quick, J. R., ed.
October 1957
Aerial Reconnaissance Lab., WADC, Wright-Patterson AFB, Ohio
AD 149,031

126. COLLECTION OF GRAPHS TO BE USED AS TABLES FOR DETERMINING OR EVALUATING THE COMBINED EFFECT OF IMAGE-MOTION AND CAMERA-LENS-FILM RESOLVING POWER ON THE CAPABILITIES OF AERIAL CAMERAS
Wernicke, B. K.
Aerial Reconnaissance Lab, Wright-Patterson AFB, Ohio; Report on Advanced Reconnaissance Equipment Stabilization, November 1958
WADC TN 58-321
AD 204,661

Graphs were organized in combinations which permit easy and fast reading of resolving power and target dimensions for large variation of such factors as altitude, exposure time, film-lens capabilities, focal length, etc. (ASTIA TAB U59)

127. AERIAL PHOTOGRAPHY
Kurowski, A.
1954
Aerial Technical Intelligence Center, Wright-Patterson AFB, Ohio. ATIC-241156, Translation F-TS-8883/III of report from Publishing Office of the Ministry of National Defense, Poland, pp. 1–65, 88–97, February 10, 1955
AD 105,336

128. THEY "CAPTURE" THE ENEMY IN THE AERIAL PHOTOGRAPH
Kuylensierna, D.
1957
Aerial Technical Intelligence Center, Wright-Patterson AFB, Ohio
ATIC-295990A; Translation F-TS-10029/V of *Teknikens Vaerld* no. 10, pp. 18–20, May 1956
AD 137,568

129. PHOTOGRAMMETRIC REFRACTION DEFORMATIONS FOR OBLIQUE HIGH ALTITUDE STEREO-MODELS
Rhodes, E. M., Meier, H.
Aero Service Corp., Philadelphia, Pa.
Interim TR 3 on Study of Earth Curvature and Atmospheric Conditions, December 1954
AF 33(616)2567
AD 71,392

The deformations caused by atmospheric refractions are plotted for 20 deg and 60 deg oblique stereo-models at 5000-ft intervals from altitudes of 40,000 to 65,000 ft. It is concluded that refraction and curvature deformations should not be combined and removed by a single mechanical means unless only an approximate correction is desired. A model warpage is indicated which would cause false relative orientation. Although small, this warpage should be considered if the refraction and curvature deformations are combined. (ASTIA)

130. **THE INFLUENCE OF ATMOSPHERIC REFRACTION ON HIGH ALTITUDE VERTICAL PHOTOGRAPHY**
Rhodes, E. M., Meier, H.
Aero Service Corp, Philadelphia, Pa.
Interim TR 1 on Study of Earth Curvature and Atmospheric conditions. August 1954
AF 33(616)2567
AD 71,394

Since tables were not available for photogrammetric refraction at 5000-ft intervals for flying heights above 40,000 ft, it was necessary to translate German publications and extend these tables to determine stereo-displacement for different heights. Translations and remarks are given for the theories of C. Aschenbrenner, A. Leijonhufvud, and P. Gast. The displacement errors computed produce a lift and dish effect on the vertical heights of a vertical stereo modes. The table extended from Gast's theory verifies Aschenbrenner's theory that as the flying altitude is increased, the dish effect decreases and the lift effect increases. The largest photogrammetric refraction error disclosed for a stereo-model at a flying height of 65,000 ft amounts to 0.00085 in. measured in the plane of the photograph, representing an error of 15.3 ft at this height. This displacement error becomes greater as the angle of obliquity increases. (ASTIA)

131. **FLIGHT VIBRATION SURVEY OF THE EFFECT OF ADDED WEIGHT OF CAMERA MOUNTING SYSTEMS**
Hook, R. D.
December 1957
Aeronautical Accessories Lab., Wright-Patterson AFB, Ohio
Report RB-50 Night Reconnaissance Camera
WADC Technical note 57-406
AD 142,189

A flight test to determine the vibration characteristics of various weights located in a camera mount system of an RB-50 aircraft is described. The purpose of this test was to determine the effect of variations in weights on the flight vibration characteristics of a camera mounting system. It was considered that heavy cameras would not vibrate with the same characteristics as for light weight cameras. The flight test confirms that the larger mass vibrates less in all ranges except at its natural frequency. The vibration at the natural frequency remains the same or shows a slight increase in amplitude for the heavier weights. (ASTIA TAB U 58)

132. **CONSTRUCTION OF AN ALL-SKY CAMERA**
Davis, T. N., Elvey, C. T.
October 1955
Alaska, University of, Geophysical Institute
Report 2
AD 143,215

133. **DESCRIPTION OF THE ALL-SKY CAMERA, ITS METHOD OF OPERATION: AN INSTRUMENT (ASCAGRAPH) FOR MEASURING THE FILM**
Elvey, C. T., Belon, A.
1957
Alaska, University of, Geophysical Institute
Scientific Report 1
AD 143,216

134. **SERVICE TEST OF CAMERA SET, STILL PICTURE, KS-26**
January 1958
Army Aviation Board
Project AVN 757
AD 157,316

Tests were conducted to determine the suitability and adequacy for Army use of the night and day photo systems and of the K-17, K-37, and K-47 cameras, and the cameras most satisfactory for large-format night aerial photography and for large-format day aerial photography. (ASTIA TAB U58)

135. EVALUATION OF CAMERA, AERIAL, KA-20, WITH POD, CAMERA MOUNT
June 1958
Army Aviation Board, Fort Rucker, Ala.
Project AVN 3357
AD 201,261

Tests were conducted to determine (1) the suitability of the cameras system for use in combat surveillance, and (2) if there are any increased values in the photography produced by this camera system over other systems tested. Tests revealed that the system is unsuitable for use in combat surveillance because of image motion compensation and film-transport limitations. The pod mount was suitable and the photographs were in some ways superior. Improvements in new KA-20(XM-2) camera appear to have corrected most of the present discrepancies .

136. SERVICE TEST OF CAMERA, AERIAL, DRONE, KA-20 (XM-2)
Murphy, A. P., Byrd, W. H., Jr.
November 1958
Army Aviation Board, Fort Rucker, Ala.
Project AVN 1558
AD 208,259

The KA-20 (XM-2) aerial drone camera was installed in the SD-1 drone and photographs were taken under daylight flight conditions at various altitudes and weather conditions to determine the capability of this camera system to produce tactically valuable aerial photographs. The resultant photographs were evaluated, and comparison was made to determine if the photographs were superior, for photographic interpreter use, to those obtained from this and other systems in manned aircraft. The photography produced by this camera system is equal but not superior to that produced by other camera systems. (ASTIA TAB U59)

137. K-46 NIGHT PHOTOGRAPHIC SYSTEM
June 1958, Test report
Army Electronic Proving Ground,
Fort Huachuca, Ariz.
USAEPG-SIG 930-24
AD 201,287

Results obtained at low to medium altitudes (500 to 6000 ft) indicate that the system could be used as an interim device pending further developments.

138. ALTITUDE CAPABILITIES OF KA-20 AERIAL CAMERA
July 1958 Final Report
Army Electronic Proving Ground,
Fort Huachuca, Ariz.
AEPG SIG 930-68
AD 204,779

Photographic runs were made at altitudes of 100 to 10,000 ft above terrain in manned aircraft, and 400 to 2000 ft in drone aircraft. Photographs taken at 100 to 10,000 ft were satisfactory. The camera proved extremely versatile as it could be mounted in the RP-61 drone or Army liaison type aircraft. The shutter assembly and shutter operation controls within the camera were not sufficiently rugged for field use. This camera is not suitable for army use until the IMC control is placed on the exterior of the camera and the shutter is redesigned for more ruggedness. The camera was satisfactory in other respects. (ASTIA TAB U59)

139. BIBLIOGRAPHY AND ABSTRACTS OF ANALYTICAL PHOTOGRAMMETRY
Rosenfield, G. H.
July 8, 1957
Army Engineer Research and Development Labs, Fort Belvoir, Va.
Report 1487-TR
AD 139,408

The advent of electronic data-processing machinery has given a new look to analytical methods in photogrammetry. This report is an annotated bibliography of English language articles and reports on the subject. The abstracts are grouped according to the following headings: adjustment of aerial triangulation; analysis of the stereo model; analytical aerial triangulation; elements of exterior orientation; fictitious photography; miscellaneous computations; theory of errors in photogrammetry; and tilt determination.

140. SPECIALIZED HIGH ALTITUDE RECONNAISSANCE WEAPON SYSTEM STUDY: PHOTOGRAPHY RECONNAISSANCE SUBSYSTEM (U)
April 15, 1956
Bell Aircraft Corp., Buffalo, N. Y.
D183-945-001, AF 33(600)31242, (Secret Report)
AD 158,142

141. THE USE OF FINE GRAIN EMULSIONS IN AERIAL PHOTOGRAPHY
Sanborn, J. L.
May 1957
Boston University, Optical Research Lab.
Technical Note 129, AF 33(616)3405
AD 135,406

To evaluate the extent to which fine-grain emulsions may be used in aerial photography, the performance of Micro-File and Perutz Pergrano emulsions has been compared with Aero Super-XX as a standard. The significance of the following factors affecting the image is considered: reduced scale, limited coverage, processing techniques, and loss of speed through the use of fine-grain emulsions. (ASTIA)

142. PHOTOGRAPHIC ANALYSIS (U)
October 1956
Chicago Aerial Industries, Inc., Melrose Park, Ill.
Report on Brass Bell Reconnaissance Weapons System. (1725; [ARDC TR-56-31]) (Subcontract to Bell Aircraft Corp., AF 18(600)1607) (Confidential)
AD 113,069

143. EFFECTS OF EARTH CURVATURE AND ATMOSPHERIC REFRACTION UPON MEASUREMENTS MADE IN STEREOSCOPIC MODELS OF HIGH ALTITUDE PHOTOGRAPHY
Kelsey A. Ray
July 9, 1952
Engineer Research and Development Labs., Fort Belvoir, Va.
AD 20,228

144. AIRBORNE 35MM ROLL FILM PROCESSOR
McCarthy, J. V., Neidle, J.
May 10–December 31, 1956
Fairchild Camera and Instrument Corp., Syosset, N. Y.
Final Engineering Report, AF 33(616)3695
AD 209,046

A study of techniques for rapid airborne processing of TV presentations was completed. The results of the study show that airborne processing is both feasible and safe. The 3 general phases of the problem investigated were film emulsions, processing media, and application methods. The results of the investigations showed the following: (1) EK type IV-0 film is the most suitable film currently available domestically; (2) a viscous monobath is the safest and most practical processing medium, and a monobath formula suitable for this purpose was developed; and (3) the viscous monobath can be applied uniformly to the film in a manner that will be unaffected by rate of film motion. (ASTIA TAB U59)

145. PROJECT HURRICOON
Church, D. A.
October 20, 1958
General Mills, Inc., Minneapolis, Minn.,
Report 1880
AD 212,386

A balloon project was begun which involved photographing weather systems at high altitudes. The work was divided into two phases: squall line and hurricane. In the first phase, balloons with attached downward directed 35mm cameras were directed over weather systems of the pre-frontal type and a series of photographs taken. The hurricane phase involved a much heavier and more elaborate system designed for long ranges over water. A special 180-deg photographic arrangement was included in this system. (ASTIA TAB U59)

146. CONTROL SYSTEM FOR TARGET AIRCRAFT CAMERAS
Davies, G. L.
November 1956
Great Britain Ministry of Supply, R.A.E.
TN-T. D. 10

Cameras in unmanned target aircraft are operated by signals sent through the radio system which controls the aircraft. Switching, timing, and synchronizing information is required by the cameras and to provide this in an acceptable form special camera control equipment is necessary in the aircraft. This equipment is described in detail and there is a more general description of the whole system from the camera control aspect.

147. AN INVESTIGATION INTO SOME OF THE EFFECTS OF CAMERA HEATING SYSTEMS ON SURVEY PHOTOGRAPHY (U)
Miskin, E. A.
February 1957
Great Britain Ministry of Supply
TIL (BR) 285, JSRP Control 580294, (Confidential MHA Report)
AD 154,666

148. RECONNAISSANCE MAPPING FROM ROCKET PHOTOGRAPHY (U)
September 1955
Hydrographic Office, Washington, D.C.
(Confidential MHA Report)
AD 140,711

149. RECONNAISSANCE PHOTO TRANSLATOR AND PHOTO-INTERPRETING DIGITAL COMPUTER
Birnbaum, M. M.
January 24, 1958
Librascope, Inc., Glendale, Calif.
RADC TR-58-34, AF 33(600)31715
AD 148,645

A description is presented of a photo translator and computer system which was designed to allow the acquisition of photogrammetric information from single oblique and vertical serial reconnaissance photographs and negatives. Through this equipment, photogrammetric calculation can be initiated, programmed, and completed in seconds. (ASTIA TAB U58)

150. DESIGN AND CALIBRATION OF A MODIFIED K-24 AERIAL CAMERA FOR PHOTOMETRIC USE
Replinger, R. J.
January 1959
Michigan, University of, Willow Run Labs.
Report 2144-333-T, DA 36-039-sc-52654
AD 211,817

A data chamber provides a means of adding to each film record of a military target and its background, necessary information about the condition under which the photograph was taken. The calibration chamber provides a means of inserting images on each frame of film of objects at various known luminances. The unknown luminances of various objects photographed with the camera may be determined from a sensitometric analysis of the film record, based upon the densities produced by the objects of known luminances. A discussion of the advantages and limitations of various means of performing photometric measurements in the field are given, including visual and photoelectric as well as photographic photometers. (ASTIA TAB U59)

151. ELEMENTARY CONSIDERATIONS IN THE OPTICAL DESIGN OF AN ALL-SKY CAMERA FOR AERIAL PHOTOGRAPHY
McNamara, A. G.
January 1957
National Research Council of Canada, Radio and Electrical Engineering Division
ERA 315, NRC 4297
AD 138,298

Two configurations of all-sky cameras employing "direct" and "folded" optical systems are analyzed. First-order optical theory is employed to determine optical performance and selection of design parameters. The paper is intended to present a rudimentary analysis to fill the gap in the available literature between the mechanical description of existing all-sky cameras and the generalized higher order theory of optical systems. (ASTIA TAB U58)

152. EVALUATION OF HIGH ALTITUDE 70MM BALLOON PHOTOGRAPHY
Douglas, M. H.
December 1958
Naval Photographic Interpretation Center, Washington, D. C.
PIC 221/58-U
AD 209,001

Results indicate that this photography is suitable for general reconnaissance interpretation and for indicating areas of active interest for which larger scale coverage is required, but it is not suitable for detailed installation studies or for tactical interpretation involving small objects. (ASTIA TAB U59)

153. NEW METHODS OF RECONNAISSANCE AND INTELLIGENCE FROM AERIAL PHOTOGRAPHY ESPECIALLY BY MEANS OF NEW TYPES OF FILMS AND FILTERS.
September 30, 1953
O'Neil, Hugh T., and Associates, Annapolis, Md.
TR 1, AF 33(616)262
AD 203,988

Contents: a basic study of the factors which influence the recognition of objects in aerial photographs; preliminary review and study of past and present color systems, processes and techniques to determine their possibilities for inclusion in an improved film for aerial

reconnaissance; a determination of the characteristics such as the value, contrast and color which are necessary in aerial photographs in order to extract the maximum amount of information from monochromatic two color and three color aerial photographs; preliminary research of the suitability of techniques of exposing black and white films with alternating color filters producing stereo pairs with different tonal renditions for aerial reconnaissance. (ASTIA TAB U59)

154. **FEASIBILITY AND PRELIMINARY DESIGN STUDIES FOR SELF-CONTAINED AIRBORNE CAMERA POD**
April 1957
Photogrammetry Inc., Washington, D.C.
Contract N178s-7256
AD 135,833

155. **HIGH-ALTITUDE SMALL-SCALE AERIAL PHOTOGRAPHY**
DiPentime, A. F.
July 1958
Rome Air Development Center, Rome, N. Y.
RADC TN-58-165
AD 148,777

RADC sent a balloon-borne camera to an altitude of 100,000 ft. in order to obtain high-altitude, small-scale aerial photographs. The apparatus is described and the pictures evaluated. A typical photograph encompasses an area 24.9 miles square at a scale of 1.701,000. All photographs were of extremely high quality.

156. **HAZE AND ITS EFFECT ON NIGHT AERIAL PHOTOGRAPHY. III**
Camp B. H., Kay A. S.
February 5, 1953
Wesleyan University, Ordwes Laboratory, Windsor Locks, Conn.
Research Report, Technical Note 25,
AF 33(038)3664
AD 7,656

Investigation was undertaken to estimate the relative advantages of using various wave lengths in high-level night photography. Emphasis is on making a comparison between deep-red and panchromatic films. Contrast is to be evaluated by using the relation $C = (H + G)/H$, where H is the ratio of haze brightness to intensity of flash and G is the ratio of ground brightness to intensity of flash. The necessary theory is developed, and a special formula is given which separates the extinction coefficient at each wave length into 3 components: one due to molecules, one to aerosols and one to heavier particles. The particular cases considered indicate that the increase in contrast is important in going from the region $= 0.55\ \mu$ to $0.90\ \mu$, when the haze is thin, but not when it is thick. The theory also indicates that even for thin haze, very little contrast will be expected in pictures taken with the magnesium burner because of the closeness of the flare to the camera. (ASTIA)

C. Books

157. **APPLIED PHOTOGRAMMETRY**
Anderson, R. O.
J. W. Edwards, Publisher, Inc., Ann Arbor, Mich., 1939

158. **PHYSICAL ASPECTS OF AIR PHOTOGRAPHY**
Brock, G. C.
Longmans, Green and Co., Inc., New York, 1952

159. **ELEMENTS OF PHOTOGRAMMETRY**
Church, E., Quinn, A. O.
Syracuse University Press, Syracuse, N. Y., 1948

160. **MILITARY MAPS AND AIR PHOTOGRAPHS**
Lobeck, A. K., Wentworth, J. T.
McGraw-Hill Book Co., Inc., New York, 1944

161. **ABC'S OF PHOTOGRAMMETRY. PART I. FUNDAMENTALS PART II. TILT AND EXTENSION**
McNeil, G. T., Anderson, R. O.
Photogrammetry, Washington, D.C., 1949

162. **ANALYTICAL PHOTOGRAMMETRY**
Merritt, E. L.
Pitman Publishing Corp., New York, 1958

163. **AN OUTLINE OF PHOTOGRAMMETRY**
Scheidefsky, K., tr. by Fosberry, J.
G. P. Putnam's Sons, New York, 1959

164. PRACTICAL PHOTOGRAMMETRY
Sharp, H. O.
Macmillan Co., New York, 1951

165. AERIAL PHOTOGRAPHS AND THEIR APPLICATIONS
Smith, H. T. U.
Appleton-Century-Crofts, Inc., New York

166. AERIAL MAPPING AND PHOTOGRAMMETRY
Trorey, L. G.
Cambridge University Press, New York, 1952

167. ADVANCED SURVEYING AND MAPPING
Whitmore, G. D.
International Textbook Co., Scranton, Pa.

II. HIGH-SPEED CAMERAS

A. Periodicals

168. PHOTOGRAPHY APPLIED TO SCIENCE
Willott, G. H.
Mechanical World, v. 88, no. 2295, pp. 601–603, December 26, 1930

169. CAMERAS OF TOMORROW
Hake, I. B.
Journal of the SMPE, v. 17, no. 3, pp. 401–405, September 1931

170. USE OF KERR CELLS FOR THE MEASUREMENT OF TIME INTERVALS AND THE PRODUCTION OF FLASHES OF LIGHT
Beams, J. W.
Review of Scientific Instruments, v. 1, pp. 780–793, December 1930

The Kerr cell is well suited to the measurement of very small intervals of time and the production of short flashes of light. The paper reviews the present knowledge on the subject, and describes the technique developed by the author for investigation of the order of appearance of spectrum lines in sparks and condensed discharges. An arrangement is also described to enable an observer to view phenomena for a very short time at a definite stage without masking effects of the preceding and succeeding parts, or to produce flashes of light of short duration.

171. ULTRA-RAPID KINEMATOGRAPH CAMERA GIVING 2000 TO 3000 EXPOSURES PER SECOND
Huguenard, E., Magnan, A.
Comptes rendus hebdomadaires des séances de l'académie des sciences, v. 192, pp. 1370–1372, June 1, 1931

By use of four objectives, each focusing on one quarter of the width of a normal film, and a sector-shutter arranged to open them in uniform succession 3 times per sec, twelve photographs are obtained in the length of film usually occupied by one. When film is reeled off at 3 m/sec this gives 2400 images/sec. With film speeds already attainable, 10,000 photographs/sec are possible. The method has been applied to a study of the free flight of insects. (*PA*, 1931)

172. DIE SIEMENS-KINO-KAMERA
Wessling, H.
Siemens-Zeitschrift, v. 3, no. 6, pp. 325–332, December 1933

173. ALL-SEEING EYE
Aviation, v. 32, no. 7, pp. 211–212, July 1933

A multiple-lens camera is described which lends speed and accuracy to map-makers.

174. NON-INTERMITTENT HIGH-SPEED 16 mm CAMERA
Tuttle, F. E.
Journal of the SMPE, v. 21, no. 6, pp 474–477, December 1933

175. ULTRA-SPEED KINEMATOGRAPH CAMERA
Suhara, T.
Proceedings of the Imperial Academy, Tokyo, v. 10, pp. 452–455, October, 1934 (in English)

Briefly describes an improved camera capable of taking photographs at the rate of 60,000/sec, the camera being built on the same principle as that previously described. Photographs are given illustrating a rifle bullet penetrating a steel plate (filming rate 53,400 pictures per sec), and the free explosion of an ordinary rifle cartridge firmly fixed on a frame (filming rate 60,345 pictures per sec). *(PA,* 1935)

176. NEW METHOD OF INVESTIGATING PHOTOGRAPHIC PROCESSES BY MEANS OF THE ELECTRO-OPTICAL KERR EFFECT

Narath, A.

***Zeitschrift für technishe Physik*, v. 15, no. 12, pp. 568–572, 1934; also in *Zeitschrift für Physik*, v. 35, pp. 992–996, December 1, 1934**

Photography of the characteristic curves of the Kerr cell allows quantitative conclusions to be drawn concerning the intensity and wave-length of actinic light. For monochromatic light (436 mμ) this proved possible up to the ninth maximum, but deviation from theory is caused by a superposed continuous spectrum. Perfect agreement is, however, obtained when a sodium-vapor lamp is used; no dichroism is observed even with the highest strengths of field (2 × 105 volt/cm.). For polychromatic light the characteristics may be calculated, and this is done for bands of a continuous spectrum of constant intensity ranging from 10- to 120-mμ in width. At high strengths of field the ratio of the transmitted intensity to the constant intensity of light current approaches the 0.5 more rapidly as the band is broadened. These results may be applied to the interpretation of photographic processes. *(PA,* 1935)

177. TIMING DEVICE FOR MOTION PICTURES

Zechel, G., Morgenstern, O.

***Science*, v. 81, pp. 23–24, January 4, 1935**

The study of any morphological state attains its full value only when a record is taken of the stages which precede and follow it. The authors describe an apparatus which automatically operates a motion picture camera so that single exposures are taken in adjustable intervals from 1 sec to 10 min, switching on the light source just before exposure and off again immediately after the photograph is taken in order to preserve the living object. The equipment consists of a motor-driven impulse transmitting one impulse to light the lamp and one impulse to a tripping magnet which when energized presses the release button of the camera for one picture. Naturally the impulse for lighting the lamp must be transmitted just before the exposure impulse so that on exposure the lamp is at full brightness. *(PA,* 1935)

178. CAMERA FOR ELECTRON DIFFRACTION

Darbyshire, J. A., Cooper, E. R.

***Journal of Scientific Instruments*, v. 12, pp. 10–14, January 1935**

Complete details are given of a camera designed to enable a wide range of experiments on electron diffraction to be carried out. The apparatus is suitable both for reflection and transmission and also any general type of rotation of the specimen examined. *(PA,* 1935)

179. ELECTRON DIFFRACTION CAMERA

Germer, L. H.

***Review of Scientific Instruments*, v. 6, pp. 136–142, May 1935**

An electron diffraction camera designed for the study of surfaces by the reflection method is described. Flexible copper bellows are used to produce motions inside the evacuated container. The current may be varied from 3×10^{-11} to 3×10^{-9} ampere, the larger values being used for rough surfaces. The time of the exposure of the photographic plate is about 10 sec. *(PA,* 1935)

180. PENDULUM SHUTTER FOR CONTINUOUS EXPOSURE OF PHOTOGRAPHIC LAYERS

Luther, R., Stade, G., Heider, W.

***Zeitschrift für wissenschaftliche Photographie*, v. 34, pp. 97–104, March 1935**

A loaded sector disc capable of making a complete revolution under gravitational action is used to give time intervals on a photographic record of 1/1000 to 1/3000 sec with an error of about ± 0.5%. The interval is calculated by developing the equation of motion of the disc, allowance being made for friction, and is checked experimentally by means of a tuning fork. In the range used, agreement is found between the time and intensity scales. *(PA,* 1935)

181. HIGH SPEED MOTION PICTURES

Edgerton, H. E.

***Electrical Engineering*, v. 54, no. 2, pp. 149–153 February 1935**

182. ULTRA SPEED IN MOTION PICTURES

Electronics, v. 8, no. 12, pp. 6–10, December 1935

New camera can produce 3000 pictures per sec.

183. NEW METHOD FOR THE TESTING OF PHOTOGRAPHIC SHUTTERS

von Liempt, J. A. M., de Vriend, J. A.

***Zeitschrift für Physik*, v. 95, no. 3–4, pp. 198–201, June 4, 1935**

The shutter was placed between a tungsten filament opal lamp and a caesium vacuum photoelectric cell giving a response current proportional to the incident light and hence to the shutter opening. The voltage generated by the message of the photoelectric current through a high resistance was applied to the deflecting plates of a cathode-ray oscillograph. The light spot on the flourescent screen of the oscillograph and a small ac neon light (to fix a time scale) were photographed together on a moving plate actuated by a spring which was released simultaneously with the release of the shutter. In this way the complete time-opening curve of the shutter could be obtained and from this the equivalent exposure and the efficiency could be calculated. (*PA*, 1935)

184. ULTRA-RAPID KINEMATOGRAPH CAMERA FOR 9 MM FILMS, GIVING 1,500 TO 2,000 IMAGES PER SECOND

Magnan, A.

***Comptes rendus hebdomadaires des séances de l'académie des sciences*, v. 200, pp. 804–805, March 4, 1935**

Briefly describes developments introduced since 1931 dealing particularly with a camera taking a 9 mm film and giving 1500-2000 exposures per sec, each negative being 9×7.5 mm. The film speed is 15 m/sec, and the camera is equipped with a 5-opening rotating shutter driven at a speed of 400 rps. Direct development of the film as a positive is used, and a projection speed of 16/sec is suggested as giving an excellent reduction. (*PA*, 1935)

185. PROPERTIES AND APPLICATIONS OF LENTICULAR FILMS

Heymer, G.

***Zeitschrift für wissenschaftlishe Photographie*, v. 34, pp. 105–118, March 1935**

A general account is given of the manufacture, properties and applications of this new product of the photographic industry. The film described is prepared from ordinary film by means of an engraving roller which imparts a lenticular form to the non-sensitive side of the film, which thus acts like a series of cylindrical lenses and gives rise to images on the sensitive layer beneath. The laws of image formation are considered theoretically and the dimensions (focal length and width) for Agfa and Kodak color films are given. The application of the film to color photography and the copying of colored images and stereo pictures is described, together with the possibilities in color kinematography. (*PA*, 1935)

186. MEASUREMENT OF TIME AND EFFICIENCY OF PHOTOGRAPHIC SHUTTERS

Eyles, E. D., Selwyn, E. W. H.

***Proceedings of the Physical Society*, London, v. 47, pp. 446–454, May 1, 1935**

Apparatus is described for obtaining the curves relating area with time in photographic between-lens shutters. A set of separated and illuminated apertures fitted with neutral glass filters passing certain standard fractions of the light is imaged by a lens on film wrapped round a revolving drum, the shutter acting as a diaphragm for the lens. The film is thus exposed in bands along its length. An exposure is made, with the shutter set fully open, for one revolution of the drum. The above apertures are then replaced by a second set without neutral filters, each of these apertures fitting exactly between the spaces previously occupied by two apertures of the previous set. An instantaneous exposure of the shutter is then made during another revolution of the drum. During the whole of this exposure a time scale is impressed on the film by subsidiary apparatus. After development, the points at which adjacent bands have the same density are found. These give the times at which the area of opening of the shutter was equal to the standard fractions of its full aperture. Various features of the apparatus are discussed, and particulars are given of the method of calibrating the neutral filter and of tests carried out on shutters for which curves relating area with time could be calculated. (*PA*, 1935)

187. EXAMINATION OF PHOTOGRAPHIC SHUTTERS

Arnulf, A., Schleeveis, M.

***Revue d'Optique*, v. 14, pp. 1–17, January 1935**

Describes a method of examination of shutters which determines with precision the operation characteristics of the apparatus, whatever the complexity of action and form of shutter opening. The method consists of the determination of the curve of light flux passing the shutter as a function of time, and the determination of the light passing each point of the surface of the shutter during its operation. In the determination of the light flux curve the variations of the illumination of the image of a luminous slit are recorded on a rotating sensitive plate, the rays having passed through the shutter during its operation. Visual microphotometric methods are used to obtain values of the variations of the illumination. To determine the amount of light passing each point of the shutter, the shutter is uniformly illuminated and is photographed during its operation, while the camera is focused on the plane of the leaves of the shutter. Results obtained by the method are given for three different shutters. (*PA*, 1935)

188. CONSTRUCTION OF 16-MM FILM APPARATUS

Lummerzheim, H.

***Zeitschrift des Verein Deutscher Ingenieure*, v. 80, pp. 913–917, July 25, 1936**

Discusses the fundamental principles of the construction of apparatus for 16-mm films dealing with the film camera and projection apparatus considering projection, illumination and optical arrangements and electrical equipment. Finally the use of small sound and color films is briefly considered. (*PA*, 1936)

189. HIGH-SPEED PHOTOGRAPHY

Edgerton, H. E., Germeshausen, K. J., Grier, H. E.

***Photographic Journal*, v. 76, pp. 198–204, April, 1936**

Briefly describes a method of high-speed photography developed for the study of oscillations of synchronous motors following changes in load and during the transient period of the motor as it endeavors to pull into synchronism. The control of the illumination, which is obtained from discharge tubes, is by means of electronic amplifiers, these consisting of a condenser, induction coil and grid-controlled mercury-arc rectifier. The grid of the rectifier is actuated by a commutator on the camera, thereby spacing the pictures correctly. A speed of 1200 pictures/sec is obtainable with full-frame 35 mm pictures, capable of increase up to 6000/sec by reducing the frame size. (*PA*, 1936)

190. UNIVERSAL CAMERA FOR ELECTRON DIFFRACTION AT 10 TO 100 KV

Yearian, H. J., Howe, J. D.

***Review of Scientific Instruments*, v. 7, pp. 26–30, January, 1936**

A camera is developed by electron diffraction to be used with either a hot filament cathode or cathode rays from a discharge tube. The camera is equipped with a specimen holder which allows diffraction patterns to be taken with either reflected or transmitted electron beams. The specimen can be rotated for investigation of fibre structure or oriented crystal growth; it also can be cooled to $-180°$ or heated to 600°. The camera is equipped to take 40 exposures without re-evacuation. The time of exposure can be preselected in the range from 1/10 sec to 1 min. An arrangement to photograph the diffraction pattern of a standard substance on the same plate with that of the specimen under investigation eliminates the necessity of an accurately calibrated high tension voltmeter. The whole assembly is connected with rubber gaskets allowing a quick interchange from one type of camera or electron source to the other. Diffraction pattern can be obtained with electrons of 10- to 100-kv energy. (*PA*, 1936)

191. ELECTRIC DRIVING AND TIMING APPARATUS FOR MICROKINEMATOGRAPHY

Goetz, A., Romer, A.

***Review of Scientific Instruments*, pp. 6–11, January, 1936**

The apparatus described serves as an electric drive of a motion-picture camera. It permits, in contradistinction to other devices for the same purpose, the independent adjustment of the exposure time and the interval between the exposures. The former can be adjusted between 0.2 and 5 sec, the latter continuously over a range factor 5000. Two applications of this apparatus in the field of microkinematography are described; one, the determination of the falling speed of suspended colloid particles in an ultramicroscope, the other, the recording of the growth of etch figures on crystal planes produced by electrolysis. (*PA*, 1936)

192. PHOTOGRAPHIC EXPOSURE FACTORS

Holmes, J. G.

***Journal of Scientific Instruments*, v. 13, pp. 89–91, March, 1936**

The variables affecting the value of the exposure factor of a photographic filter are discussed and the indeterminate errors in the measurement of the factor are avoided by precautions in the design and use of the camera. The results obtained appear accurate to ± 3.5% and enable an interesting comparison to be drawn between the values of the factor of a filter under different conditions of use. *(PA,* 1936)

193. WEIGERT'S PHENOMENON

Freundlich, H.
***Photographic Journal*, v. 76, pp. 395–404;**
Discussion, pp. 404–406, July, 1936

Deals with the importance of this phenomenon in photography, after giving simple conceptions of dichroism and double refraction. Weigert found that light can act as an external orientating force upon colloidal systems, and his original discovery, using photochlorides, is briefly described. Kuhn's discovery that an aqueous gel of cotton-yellow shows photoanisotropy is discussed and the photo-anisotropic behaviour of photohalides is dealt with in more detail. Light of long wave-length produces marked primary photodichroism except at very low temperatures, AgCl and Ag are essential for the phenomenon, but not gelatin, and the total amount of metallic silver does not change on formation of the dichroic spot. Finally, devel-opable photoanisotropy, discovered by Weigert, and the action of circularly polarized light are considered. *(PA* 1936)

194. SIEMENS-KINOGERALTE FUER 8-MM FILM

Weinburger, M.
***Siemens-Zeitschrift*, v. 16, no. 11, November 1936**

195. REALISATION OF UNDEFORMABLE CELLULOSE ACETATE FILMS FOR PHOTOGRAPHY

Charriou, A., Valette, S.
***Photographic Journal*, v. 76, pp. 27–31, January, 1936**

Gives the results of an investigation undertaken to produce an undeformable film, the best results being obtained by using cellulose acetate containing about 60% of acetic acid, plasticised with triphenyl phosphate and dissolved in methylene chloride-ethanol, the films being left in a stove at 100°C for 4 hr. The results given deal with the influence of chemical composition—proportion of plasticisers and acetic acid, and influence of after-treatment—treatment of films by water and heat. Finally, the interpretation of these results is considered, showing that the above method results in a film which has normal transparency and elasticity and can be soaked in water without deformation even after drying for 3 months. *(PA,* 1936)

196. PHOTOELECTRIC PHOTOGRAPHY

Lallemand, A.
***Comptes rendus hebdomadaires des séances de l'académie des sciences*, v. 203, pp. 242–244,**
July 20, 1936

Apparatus is described whereby photoelectrons are registered photographically. The arrangement is analgous to that employed in electron optics. *(PA,* 1936)

197. NEW PHOTOGRAPHIC PROCESS

Kosnogova, K. M.
***Comptes rendus hebdomadaires des séances de l'académie des sciences*, USSR, v. 1, no. 4,**
pp. 167–168, 1936

Briefly describes a new photo-electrochemical process which is capable of giving photographic images, but only after electrochemical polarization. Cu electrodes coated with CuI are illuminated and then cathodically polarized in a $Pb(NO_3)_2$ solution. At a potential of 0.3 V below the natural electrode potential the illuminated parts change color from white to green. The light action is appreciably increased by coloring the electrodes by means of dyes. *(PA,* 1936)

198. HIGH-SPEED MOTION PICTURE CAMERA FOR RESEARCH ON SURFACE TENSION

Hauser, E. A., Edgerton, H. E., Holt, B. M.,
Cox, J. T., Jr.
***Journal of Physical Chemistry*, v. 40, pp. 973–988,**
November 1936

Pictures of the formation and fall of drops were taken at the rate of 1,200/sec. Successive steps in the formation of drops and in the segmentation of "stems" observed to follow the drops were studied. The size of the main drop of a pure non-viscous liquid decreases with time of drop formation. The length of the stem increases with decrease of surface tension, but for water containing capillary-active substances the length of the stem is shorter than that of pure water. An explanation of this is offered. The

size of the secondary drops expressed in terms of the main drop increases materially with decreasing surface tension. The measurement of the oscillations of the secondary drops gives a new means of studying adsorption at freshly formed surfaces. The ring method was studied by means of photographs taken at the rate of 600/sec. The influence of viscosity on the mechanism of the rupture is indicated. A new method of surface tension determination based on the measurement of the oscillations of the thin liquid film formed across the ring immediately after rupture is demonstrated. It is finally concluded that the phenomena connected with both the drop-weight and ring method are so highly complicated that neither method is ideal for accurate surface-tension determinations. *(PA,* 1937)

199. APPAREIL DE PRISE DE VUES ULTRA-RAPIDE, SYSTEME MERLIN ET GERIN, POUR PROJECTION CINEMATOGRAPHIQUES AU RALENTE

Génie Civil, v. 109, no. 2818, pp. 149–150, August 15, 1936

A super-speed camera for slow motion projection is described.

200. DYNAMICAL BASIS OF THE ROTATING-DISC SHUTTER

Maass, G.

Photographic Industries, v. 35, pp. 876–878, August 18, 1937

The "robot"—shutter consisting of a rotating disc with open sector of fixed angular size, the speed of rotation being varied, can be made to operate at an essentially uniform speed throughout its operation, thus avoiding the distortions and irregularities which arise with shutters of the "roller-blind" type having variable openings. The elementary dynamics of the system is given. *(PA,* 1937)

201. DRUM CAMERA FOR RECORDING TRANSIENT PHENOMENA

Lutkin, F. E.

Journal of Scientific Instruments, v. 14, pp. 209–212, June, 1937

A drum camera is described which is used in conjunction with a cathode-ray tube for recording the wave form of "atmospherics." The patterns are registered as departures from a very closely pitched helical zero line, and records equivalent to those obtained previously with 1000 ft. of 35 mm film can now be made on 1 m of paper 10 cm wide. *(PA,* 1937)

202. MODIFICATION OF CAMERA RANGE-FINDER

Littlefield, T. A.

Journal of Scientific Instruments, v. 14, pp. 229–231, July, 1937

Modern cameras equipped with range-finders, so coupled to the lens that focusing is accomplished by adjusting the range-finder images to coincidence, lose this advantage when the camera lens is supplemented by a second converging lens for the photography of objects at close range. The advantage of focussing by adjustment of the range-finder is, however, especially desirable under these conditions in view of the very limited depth of field, and it may be preserved if the indirect window of the range finder be provided with a supplementary prism, chosen to match the focal length of the supplementary lens. *(PA,* 1937)

203. ILLUMINATION CHARACTERISTICS OF THE CAMERA LENS

Benford, F.

Journal of the Optical Society of America, v. 27, pp. 286–287, August, 1937

On theoretical grounds, it is shown that for an ideal thin lense the illumination at film $\alpha \cos^4 \theta$. For an actual thick lens the effect is greater, and in a diagram the illumination is shown for various film widths and iris settings. The effect is of importance for photographic photometry. *(PA,* 1937)

204. PRECISION, ALL-PURPOSE MICROCAMERA

Graton, L. C., Dane, E. B., Jr.

Journal of the Optical Society of America, v. 27, pp. 355–376, November 1937

This microscope, intended primarily for photography with transmitted or reflected light, and particularly at high powers, departs widely from conventional design, especially in massive structure, appropriate materials, and high precision. Its most novel part is the motor-driven, fine focussing mechanism which is 100 times

slower than on standard instruments; 1 scale division= 0.001 micron or 100Å. With this precise control of focus and with material for investigation believed superior to any hitherto employed for testing lens quality, results are secured and illustrated which indicate that true depth of focus is substantially less and resolution substantially greater than current theory would permit. Thus, change of focus of 1000 Å wide is revealed in a photograph at 3175 diameters. It is questioned whether existing microscopical theory may need review. Since present lenses apparently surpass their theoretical limits, a plea is made for better lenses. (*PA*, 1938)

205. ROTATING DRUM CAMERA FOR PHOTOGRAPHING TRANSIENT PHENOMENA

Lambert, R.

***Review of Scientific Instruments*, v. 8, pp. 13–15, January 1937**

A rotating drum camera, suitable for photographing transient voltages or currents with a cathode-ray oscillograph, is described. Film speeds up to 750 in/sec have been employed. The times of exposure are controlled and related transient phenomena are synchronized by means of rotating switches. (*PA*, 1937)

206. HIGH-SPEED PHOTOGRAPHIC MEASUREMENTS

Edgerton, H. E., Germeshausen, J. K., Grier, H. E.

***Journal of Applied Physics*, v. 8, pp. 2–9, January 1937**

Several high-speed non-stroboscopic cameras are described and details are given of their operation and applications. The basic phenomena involved in taking such photographs with the light from electrical discharges are discussed at length. Stroboscopic types of apparatus are also discussed. Details are also given of the moving-optical-system type of camera. (*PA*, 1937)

207. FILM CAMERA FOR CATHODE-RAY OSCILLOGRAPH EXPERIMENTS ON ARTIFICIAL RADIOACTIVITY

Grimmett, L. G., Rann, W. H.

***Journal of Scientific Instruments*, v. 14, pp. 96–100, March 1937**

A description is given of the construction and performance of a new film camera for photographing the movements of the light spot of a cathode-ray oscillograph. Four tracks are taken on a 36 mm film. The film speed can be varied automatically to follow the activity being studied, or set at a constant value. An automatic mechanism is provided for reversing the film at the end of the track and lifting it into position for the next track. (*PA*, 1937)

208. HIGH-VACUUM MULTIPLATE CAMERA

Richards, D. A., Bound, R. A. M.

***Journal of Scientific Instruments*, v. 14, pp. 402–406, December 1937**

The apparatus described was designed to enable several exposures to be made in an electron diffraction camera without letting down the vacuum to remove or replace the photographic plates. The plate changing device can be used equally well with an electron camera or a cathode-ray oscillograph. A feature of the apparatus is that flexible metal bellows are used throughout to avoid the use of ground joints. (*PA*, 1938)

209. THEODOLITE FITTED WITH A SHUTTER EYEPIECE

Hunter, J. de G.

***Proceedings of the Royal Society of London*, v. 166A, pp. 197–213, May 19, 1938**

The moving-wire micrometer, fitted to transit instruments for reducing personal errors in time determinations, requires a chronograph and is too bulky for use on a field instrument for longitude work. The shutter eye-piece described in this paper has been designed for use with a theodolite and break-circuit chronometer. An opaque shutter close to the focal plane of the telescope objective exposes a star for observation for an instant at a time controlled by the chronometer. In practice, the star is exposed for 0.070 sec at every third second; and its successive positions are read by means of an illuminated scale consisting of 40 horizontal lines ruled at intervals of 0.001 in. on a glass plate. Time comparisons with the rhythmic signals from Rubgy or Bordeaux are made by noting the complete extinction of an incoming signal by a contact, operated by the shutter, in the output circuit of the radio receiver. A full description is given of the trial longitude observations and their reduction. For a 2-hr program, a probable error of 0.04 sec on longitude is claimed with the equipment used. (*PA*, 1938)

210. SCHMIDT CAMERA
Observatory, 61, pp. 156–159, June 1938

A brief, non-mathematical account is given of the nature and power of this important instrument. It is essentially an instrument for producing a wide-angle field of good definition even with small focal ratios. The camera employs as objective a spherical mirror, and to overcome the severe spherical aberration which would otherwise be encountered, a plate is introduced at the center of curvature which leaves the central rays falling on the mirror undisturbed while the outer ones are rendered slightly divergent. The quality of the results depends upon the figuring of the correcting plate, which is quite laborious. Good fields of up to 20 deg have been obtained. (*PA*, 1938)

211. PHOTOGRAPHIC RESOLVING POWER IN THE CONSTRUCTION OF OPTICAL INSTRUMENTS
Hansen, G.
Photographic Industries, v. 36, pp. 692–694, June 15, 1938; pp. 716–720, June 22, 1938

A lecture review of the role of photographic resolution in the design and construction of optical instruments. (*PA*, 1938)

212. STUDIO PHOTOGRAPHY
Lagorio, A. V.
Zeitschrift des Vereines Deutscher Ingenieure, v. 82, pp. 283–288, March 5, 1938

Describes the present state of the development of apparatus for film studio photography in Germany, dealing with the film camera recently developed to replace the French cameras previously used, stationary and transportable tripods, lighting apparatus, measurement of scene illumination, and developing machines. (*PA*, 1938)

213. OPTICAL INSTRUMENTS
Guild, J.
Journal of Scientific Instruments, v. 15, pp. 65–72, February 1938

The instruments shown at the 1938 Exhibition of the Physical Society are reviewed. (*PA*, 1938)

214. FLARE IN SCHMIDT CAMERAS
Smiley, C. H.
Journal of the Optical Society of America, v. 28, pp. 130–132, April 1938

The flare pattern obtained when a heavy over-exposure is made with a Schmidt camera on a bright object well off-axis consists of a secondary image, halos about the primary and secondary images and annulus with these images at extremities of a diameter. The bearing of this flare pattern on the design of a Schmidt camera is discussed and it is shown how one may test a Schmidt camera by the use of its flare pattern. (*PA*, 1938)

215. ADVANCES IN THE THEORY OF PHOTOGRAPHY
Selwyn, E. W. H.
Reports of the Physical Society, London, v. 5, pp. 191–201, 1938

216. DOCUMENTARY PHOTOGRAPHY AND RESEARCH
Bradford, S. C.
Nature, v. 143, pp. 393–395, March 11, 1939

The present position is surveyed. The various processes and their availability are discussed and compared. Suggestions are made for making the services of more use to research workers. (*PA*, 1939)

217. "ULTRAPHOT" PHOTOMICROGRAPHIC APPARATUS
John, K.
Zeitschrift für Instrumentenkunde, v. 59, pp. 273–280, July 1939

The "Ultraphot," the universal photomicrographic arrangement as made by Zeiss, is described in detail. It is pointed out that other makes have been studied with a view to incorporating as many features as possible. Many uses are claimed for it. (*PA*, 1939)

218. DEVELOPMENT OF PHOTOMICROGRAPHIC APPARATUS
John, K.
Zeitschrift für Instrumentenkunde, v. 59, pp. 301–314, August 1939

The development of apparatus for photomicrography is traced from an early date. Every improvement, either

in microscopic or photographic technique, has resulted in an improvement in methods of photomicrography. Many factors which have contributed to the present day standard are discussed. Several modern instruments are briefly described. (*PA*, 1939)

219. PHOTOGRAPHY OF FINE DUST PARTICLES

Beadle, D. G.

***Journal of Scientific Instruments*, v. 16, pp. 262–263, August 1939**

It is shown that by using great contrast, both optically and photographically, more dust particles can be photographed than can be seen visually. (*PA*, 1939)

220. SUPER HIGH-SPEED PIN-HOLE CAMERA

Prince, D. C., Rankin, W. K.

***Engineering*, v. 168, no. 4379, pp. 596–597, December 15, 1939**

221. VIEWFINDERS

Martini, K.

***Photographic Industries*, v. 37, pp. 393–395, March 1, 1939**

The author traces the development of the direct type of camera viewfinder with which the operator looks in the direction of the object. The principles of modern viewfinders are explained. (*PA*, 1939)

222. METHOD OF MONOCHROMATIC PHOTOGRAPHY

Tako, H.

***Institute of Physical and Chemical Research*, Tokyo, Science Papers, no. 875, pp. 175–181, February 1939 (in English)**

An apparatus is described for taking a number of monochromatic photographs simultaneously. A beam of light is passed through a slit and then through the usual spectrographic arrangement of a lens, direct vision prism, and lens, the latter being placed so that a real image of the slit is obtained. The monochromatic beam is isolated by placing a second slit at this point, or if a number of monochromatic beams are required several slits are arranged laterally. An image is obtained by placing a third lens or a many-faced compound prism after the third slit. The apparatus is used to photograph a sodium discharge and an incandescent electric lamp. (*PA*, 1939)

223. CONSTRUCTION OF SCHMIDT CAMERAS

Cox, H. W.

***Journal of Scientific Instruments*, v. 16, pp. 257–262, August 1939**

A description is given of the methods employed in working the correcting lenses for $f/1.5$ Schmidt astronomical cameras. Details of early work are given, leading up to the development of a technique by which a correcting lens was figured correctly in a single figuring operation. (*PA*, 1939)

224. NEW METHOD FOR ADJUSTING SYNCHRONIZERS, ALSO SUITABLE FOR TESTING FOCAL-PLANE SHUTTERS

Van Liempt, J. A. M., de Vriend, J. A.

***Physica*, v. a7, pp. 217–224, March 1940 (in English)**

A description is given of a method for adjusting synchronizers for photoflash lamps with the aid of a falling-plate oscillograph (lending itself to self-construction), both for Compur and focal-plane shutters and, if desired, without spending flash lamps. The apparatus is also suitable for testing focal-plane shutters. (*PA*, 1939)

225. TREATMENT OF CAMERA LENSES WITH LOW-REFLECTING FILMS

Cartwright, C. H.

***Journal of the Optical Society of America*, v. 30, pp. 110–114, March 1940**

An f/2 photographic lens having five separated elements was treated with evaporated fluorite to decrease the reflection from all ten air glass surfaces. Photographs were taken with the lens under carefully controlled conditions before and after it was treated. The effective speed of ten lens was found to be almost doubled by the treatment. A slight increase in contrast resulted in photographs taken under normal lighting conditions and a large increase in contrast resulted in those taken under adverse lighting conditions. An increase in detail was observed, because of the absence of flare, and the ghost images usually observed under adverse lighting conditions were eliminated. (*PA*, 1940)

226. RESOLVING POWER AND THEORY OF PINHOLE CAMERA

Turner, L. A.

American Journal of Physics, v. 8, pp. 112–115, April 1940

The utility of the pinhole camera for teaching photography is emphasized and an improved theoretical treatment put forward. It is shown that the optimum diameter a of the pinhole is given by the expression $a = 2[K\lambda vu/(u + v)]^{\frac{1}{2}}$ where λ = wavelength of the light, u = distance of object to pinhole, v = that of plate to pinhole, and K a numerical factor near to unity. The value of K can be determined theoretically only by postulating some criterion for best definition, but there is no such criterion which is obviously the correct one—hence apparent contradictions in the text-book treatments. Maximum resolving power demands $K = 1.2$, and best definition $K = 0.9$, so that the best definition and resolving power are not to be had together. If the quality of the picture is to be as good as that considered satisfactory in making depth of focus tables, the hole-to-plate distance must be >45 cm. (*PA*, 1940)

227. HIGH-SPEED MOTION-PICTURE AID DESIGN

Townsend, J. R.

Electrical Engineering, v. 59, no. 11, pp. 48–50, November 1940

228. HIGH-SPEED PHOTOGRAPHY

Watson, E. M.

Product Engineering, v. 11, no. 8, pp. 340–343, August 1940

229. SOLID-GLASS SCHMIDT CAMERA AND NEW TYPE NEBULAR SPECTROGRAPH

Baker, J. G.

Proceedings of the American Philosophical Society, v. 82, no. 3, pp. 323–338, 1940

The complete fifth-order theory of image errors is applied to both the solid-glass Schmidt camera and to the usual kind of Schmidt camera. The fifth-order defect most important in the formation of images by the Schmidt camera is that called the variation of spherical aberration with angle. The Schmidt camera can be made completely aplanatic, but the resultant optical surfaces differ from those for minimum chromatic aberration. The equation of the meridian section of the correcting surface is developed through tenth-order terms in order to obtain the curve of the correcting surface to sufficient accuracy for the fastest cameras. The fifth-order theory permits a solid Schmidt camera of the limiting focal ratio of f/0.30 and over a 7 deg to be made. An exact calculation indicates that the fifth-order terms, even at f/0.30 and over a 7 deg field, represent within 10% of the exact value the numerical size of the image aberration and are completely adequate for slower cameras and moderate field. The solid Schmidt of f/0.30 is to be used as the camera in a new type nebular spectrograph. A prism arrangement is presented that affords the advantages of cheapness, compactness and low light absorption. In addition to one or more small 60 deg dispersing prisms from 2 to 4 30-6 deg prisms are added in order to spread the collimated beam of circular cross-section into a beam of elliptical cross-section entering the camera. This device yields the above advantages without loss of speed or definition at a given dispersion. The coating of the glass surfaces in such a system is recommended in order that the total efficiency be within 90% of the theoretical limit. The prism device enables the solid Schmidt to be used off-axis without loss of light and thus affords easy access to the focal surface. (*PA*, 1940)

230. FAMILY OF FLAT-FIELD CAMERA, EQUIVALENT IN PERFORMANCE TO THE SCHMIDT CAMERA

Baker, J. G.

Proceedings of the American Philosophical Society, v. 82, no. 3, pp. 339–349, 1940

A 2-parameter family of telescopes is described that have the desirable properties of being aplanatic and anastigmatic on a flat field. Distortion, unimportant for astronomical purposes, is small; for one member of the family distortion is zero. Each member of this family of cameras is equivalent in optical performance to the Schmidt camera. The tube length can be made short as ⅓ the focal length. All members of the family of cameras have a correcting plate, a primary concave mirror and a secondary convex mirror. The 2 parameters remaining after the conditions for aplanatism and anastigmatism have been satisfied are the distance of the correcting plate from the primary mirror and the distance of the photographic plate from the secondary mirror. A large field can be obtained free from vignetting. The 2 mirror surfaces

are aspherical for all but a single-parameter family for which the surfaces are so closely spherical as to require but a small fraction of the figuring of a paraboloid of the same focal length. Even in the case where both mirrors are aspherical there exist no inflection points to complicate manufacture. The curves of the optical surfaces can all be expressed as rational functions of the parameters. The properties of the families of the Schmidt and Schwarzchild mirror systems are discussed relative to this family of cameras. (*PA*, 1940)

231. **EXACT AND APPROXIMATE COMPUTATION OF SCHMIDT CAMERAS. PART I. THE CLASSICAL ARRANGEMENT**
Lucy, F. A.
***Journal of the Optical Society of America*, v. 30, pp. 251–254, June 1940**

An exact equation is derived for the surface of the correcting plate of a Schmidt camera when placed at the center of curvature of the spherical mirror. An approximate formula is also derived which is, however, rather more precise than formulae previously available. The performance of actual instruments made according to the old and new equations will differ significantly if the surfaces are figured with exceptional care. (*PA*, 1940)

232. **L'EMPLOI DU CINÉMA ULTRA-RAPIDE**
Nierenberger, R.
***Bulletin de la Société francaise des électriciens*, v. 9, no. 108, pp. 981–991, December 1939**

Use of ultra-high speed motion pictures at 80,000 images/sec and their application for scientific research and engineering is discussed.

233. **HIGH-SPEED PHOTOGRAPHY AND ITS APPLICATION TO INDUSTRIAL PROBLEMS**
Eyles, E. D.
***Journal of Scientific Instruments*, v. 18, pp. 175–184, September 1941**

A survey article which reviews the historical development of the subject and discusses the apparatus and technique. The modifications for various speeds are described and numerous examples of the uses of the technique are given. (*PA*, 1941)

234. **CONCISE REPORT ON HIGH-SPEED CAMERA FOR SIMULTANEOUS PHOTOGRAPHIC AND OSCILLOGRAPHIC RECORDS**
Baxter, H. W.
***Journal of Scientific Instruments*, v. 19, no. 12, pp. 183–184, December 1942**

235. **FASTAX ULTRA-HIGH-SPEED MOTION-PICTURE CAMERA**
Smith, H. J.
***Bell Laboratories Record*, v. 22, no. 1, pp. 1–4, September 1943**

This camera is capable of taking 8000 pictures/sec.

236. **PHOTOELECTRIC FLASH CAMERA**
***Electronic Industries*, v. 3, no. 7, p. 95, July 1944**

The new Fairchild camera with photoelectric unit is described.

237. **DESIGN METHOD FOR SCHMIDT CAMERA WITH FINITE SOURCE**
Benford, F.
***Journal of the Optical Society of America*, v. 34, no. 10, pp. 595–596, October 1944**

The graphical method in design of camera normally used for astronomical work is discussed.

238. **ULTRA SPEED CAMERA UTILIZES CONSTANT FEED**
***Machine Design*, v. 16, no. 4, p. 146, April 1944 (*EI*, 1944)**

239. **LENS FOR MINIATURE CAMERA**
Cornog, I. C.
***American Journal of Physics*, v. 13, no. 1, pp. 41–43, February 1945**

240. **8000 PICTURES PER SECOND**
Smith, H. J.
***Journal of the SMPE*, v. 45, no. 3, pp. 171–183, September 1945**

241. **TECHNIQUE FOR PRACTICAL HIGH SPEED MOTION PICTURES**
Painter, R., Huber, P.
***SAE* Preprint for meeting January 8–12, 1945**

242. NEW METHODS OF TESTING PHOTOGRAPHIC SHUTTERS

Kalman, L.

***Schweizer Archiv für angewandte Wissenshaft und Technik*, v. 11, pp. 175–181, June 1945**

This article describes photoelectric apparatus for testing shutter speeds. An emission-type cell charges a condenser to a voltage which is proportional to the exposure given by the shutter. The method of calibrating the instrument is described, and there is a discussion of the characteristics of central opening, focal plane and special types of shutter. Typical results, obtained with certain shutters fitted to high-price cameras, are given. The departures from the nominal values are small, but with less carefully constructed shutters errors may be very considerable. Accuracy of shutter speed is increasing in importance, especially for color film. (*PA*, 1946)

243. NACA HIGH-SPEED MOTION-PICTURE CAMERA OPTICAL COMPENSATION AT 40,000 PHOTOGRAPHS PER SECOND

Miller, C. D.

***National Advisory Committee for Aeronautics*, Report 856, 1946**

This camera, invented in 1936, at Langley Field Laboratory, took photographs concerning combustion, preignition, and knock in spark ignition engines. (*EI*, 1949)

244. WHO INVENTED PHOTOGRAPHY?

Jackson, E. W.

***Society of Chemical Industry*, v. 42, pp. 330–332, October 27, 1945**

245. RIBBON FRAME CAMERA

Hickman, C. N.

***Army Ordnance*, v. 29, no. 152, pp. 238–240, September–October 1945**

246. HIGH SPEED LINEAR PHOTOGRAPHY

Harvey, E. N., Sichel, F. J. M.

***Journal of Cellular and Comparative Physiology* v. 25, pp. 175–179, June 1945**

A method of utilizing a light source (dc carbon arc 15-20 A), a cylindrical lens and a photographic film moving rapidly and continuously in a direction perpendicular to the direction of the movement studied, is here used to record the change in width of living muscle fibre striations during contraction. It can be used with high powers of the microscope and is equivalent to taking over 1000 pictures/sec. It may be adapted to record any changes in position of structure which take place in only one direction. (*PA*, 1946)

247. THE PROBLEM OF THE TILTED CAMERA

Lee, H. W.

***Photographic Journal*, Section B, v. 85, pp. 101–104, September–October 1945**

The positions of objects can be determined by measurement of the rectangular coordinates of their images photographed by a lens of known focal length. If the camera axis is tilted, either (a) a rectified print must be made by projection or (b) formulae used, in order to fix the exact positions in space. Both methods are examined. (*PA*, 1946)

248. INSTRUMENT FOR INVESTIGATING THE OPERATION OF CAMERA SHUTTERS

Dighton, D. R., Ross, H. M.

***Photographic Journal*, Section B, v. 86, pp. 110–116, September–October, 1946**

A characteristic curve of the shutter is portrayed on the screen of a cathode ray tube. No synchronization is needed between the shutter and instrument, since the traverse of the fluorescent spot starts immediately as the shutter blades begin to open. After the curve has been drawn, the spot makes a second traverse, closing in the base line of the pattern and adding vertical timing marks at 1/10, 1/100 or 1/1000 sec intervals. The curve remains visible for several seconds, and automatic brightness control maintains an even brightness at all parts of the curve. A miniature discharge flash-tube has been built into the instrument, and may be flashed at any point in the operating cycle of the shutter, for inspecting the shutter and its mechanism during operation. (*PA*, 1947)

249. ELECTRONIC SHUTTER TESTERS

Redemske, R. F.

***Electronics*, v. 19, no. 2, pp. 128–134, February 1946; also in *Journal of SMPE*, v. 46, no. 5, pp. 409–423, May 1946**

250. ON IMPROVEMENT OF RESOLUTION IN ELECTRON DIFFRACTION CAMERAS
Jillier, J., Baker, R. F.
Journal of Applied Physics, v. 17, no. 1, pp. 12–22, January 1946

251. HIGH SPEED CAMERA
Baird, K. M.
Canadian Journal of Research, Section A, v. 24, no. 4, pp. 41–45, July 1946

252. WIDE ANGLE 35MM HIGH SPEED MOTION PICTURE CAMERA
Waddell, J. H.
Journal of the SMPE, v. 46, no. 2, pp. 87–102, February 1946

253. OPTICAL PROBLEMS OF IMAGE FORMATION IN HIGH SPEED MOTION PICTURE CAMERAS
Kudar, J.
Journal of the SMPE, v. 47, no. 5, pp. 400–402, November 1946

Optical design of high speed cameras can be improved by considering results of systematic analysis of various optical aberrations which arise from rotation of polygonal refracting prism. A brief treatment of the subject is given. (*EI*, 1947)

254. HIGH SPEED PHOTOGRAPHY
Hawkins, G. A., Balleisen, C. E.
Machine Design, v. 19, no. 8, 9, pp. 127–133, August 1947, pp. 121–126, September 1947

New techniques make it possible for designers to study and develop mechanisms for operating speeds too high for eye to perceive. (August: External surfaces and opaque objects. September: Radiography and motion pictures.) (*EI*, 1948)

255. METHOD OF COMPUTING CORRECTION PLATE FOR SCHMIDT SYSTEM FOR NEAR PROJECTION, WITH SPECIAL REFERENCE TO SYSTEM FOR TELEVISION PROJECTION
Friedman, H. S.
Journal of the Optical Society of America, 37, pp. 480–484, June 1947

256. CATHODE-RAY TUBE SHUTTER TESTING INSTRUMENT
Dighton, D. T., Ross, H. McG.
Journal of Scientific Instruments, v. 24, pp. 128–133, May 1947

257. DETERMINING ROLE OF RESEARCH IN FUTURE OF MOTION PICTURE
Price, B.
Journal of SMPE, v. 48, no. 1, pp. 70–72, January 1947

General discussion of motion picture progress from early days and of prospect for future; effective capture of third dimension is cited as goal worthy of best minds; motion picture industry's need for vastly greater comprehensive research program is emphasized. (*EI*, 1947)

258. ENGINEERING PERFECTS PLASTIC CAMERA
Modern Plastics, v. 25, no. 11, pp. 107–111, July 1948

Application of plastics in Ansco Rediflex camera; choice of polystyrene, cellulose acetate, and vinyl materials to suit various special requirements; use of molded inthreads and preheated inserts. (*EI*, 1948)

259. APPARATUS FOR INVESTIGATION OF INTER-LENS SHUTTERS
Onwood, K.
Electronic Engineering, v. 20, no. 239, pp. 9–11, 16, January 1948

Three types of equipment successfully used for investigation of operation characteristics of inter-lens shutters, described; devices are integrating photometer, shutter operation curve tracer and shutter comparator; basic circuits indicated. (*EI*, 1948)

260. TESTING PHOTOGRAPHIC SHUTTERS
Duffield, S. H., Lankes, L. R.
Electronics, v. 21, no. 8, pp. 82–87, August 1948

Basic circuits used in electronic testers employing phototubes, neon lamps, multi-element electron tubes, cathode ray tubes, and iconoscopes; schematic diagrams of various systems. (*EI*, 1948)

261. LIGHT CARTOGRAPHIC CAMERA

Modern Metals, v. 3, no. 12, pp. 22–23, January 1948

Features of new Fairchild precision aerial camera designed to produce accurate photographs for compilation of precise planimetric and topographic maps by aerial photogrammetric methods; light and other metal applications in construction. (*EI*, 1948)

262. DIODE COUNTER CALIBRATES MISSILE TESTING CAMERA

Dorsey, Z. E.

Electronics, v. 31, pp. 93–95, February 14, 1948

263. PLASTIC LENSES IN TELEVISION PROJECTION

Starkie, D.

Journal of Television Society, v. 5, pp. 86–92, 1948

After explaining the suitability of Schmidt optical system for television projection purposes, the ICI process of moulding the optical components from polymethylmethacrylate and polystrene is described. The lenses are moulded and annealed in a liquid bath, cooled under control and then submitted to a surface finishing process by means of an added thin film of polymer, filling the minute gap after shrinkage. The moulds for the latter process are of glass to allow light polymerization. The problems of assembly into a complete projection apparatus are discussed, and special directional screens of lenticular type giving horizontal wide angle viewing range are described. (*PA*, 1949)

264. ELECTRONICALLY OPERATED KERR CELL SHUTTER

Froome, K. D.

Journal of Scientific Instruments, v. 25, no. 11, pp. 371–373, November 1948

Circuit is described for producing sequence of 10-12 kv square wave pulses suitable for operating small Kerr cell shutter; width of pulses (i.e. shutter exposure) and interval between them can be varied independently from each other; number of exposures can likewise be altered. Provision is also made for single exposures; circuit diagram. (*EI*, 1948)

265. HIGH-SPEED MOTION PICTURES WITH SYNCHRONIZED MULTIFLASH LIGHTING

Anderson, R. A., Whelan, W. T.

Journal of the SMPE, v. 50, no. 3, pp. 199-207, March 1948

Data on equipment designed to synchronize high intensity flash lamp with camera; camera used was 16-mm rotating prism type and synchronization was accomplished by built-in brush type contactor; electrical signal from one contactor was sent through pulse forming circuit to trigger tube in flashlamp circuit. The film speed was 1800 frames/sec and duration of each flash was about one microsecond; results obtained. (*EI*, 1948)

266. TESTING PHOTOGRAPHIC SHUTTERS

Duffield, S. H., Lankes, L. R.

Electronics, v. 21, pp. 82–87, August 1948

267. PRECISION LENS-TESTING AND COPYING CAMERA

LaRue, M. W.

Journal of the SMPE, v. 53, no. 4, pp. 379–388, October 1949

Rigidity, method of photographic plate location, and focusing accuracy of camera described are such that it fully utilizes capabilities of high definition lenses and photographic plates used with it; its general construction is sturdy, and it has been demonstrated, by 4 yr of continuous use, that little or no maintenance or repair will be required for many years. (*EI*, 1949)

268. ELECTRONIC SHUTTER TESTER

Dighton, D. T. R.

Electronic Engineering, v. 20, no. 246, p. 251, August 1948

Modifications on instrument intended for research and development on camera shutters; characteristic curve of shutter, giving curve of light as function of time provided; accurate measurements by means of calibrated time base permitted; photographs. (*EI*, 1949)

269. NAVY ELECTRONIC SHUTTER ANALYZER

Fraser, W. R.

Journal of the SMPE, v. 53, no. 3, pp. 256–267, September 1949

Shutter analyzer employing 2-gun cathode ray oscilloscope with two phototubes is designed to permit rapid analysis and solution of numerous problems commonly encountered in photography including: shutter operation and efficiency; shutter flash synchronization; shutter solenoid delay; flash gun switch, solenoid shutter delay; internal shutter switch contact time; switch or electric contact efficiency; diaphragm calibration; etc. (*EI*, 1949)

270. AN ICONOSCOPE ELECTRO-OPTICAL SHUTTER FOR HIGH SPEED PHOTOGRAPHY
Prime, H. A., Turnock, R. C.
***Review of Scientific Instruments*, v. 20, p. 829, November 1949**

271. ELECTRO-OPTICAL SHUTTER FOR PHOTOGRAPHIC PURPOSES
Zarem, A. M., Marshall, F. R., Poole, F. L.
***Transactions of the American Institute of Electrical Engineers*, v. 68, pt. 1, pp. 84–91, 1949**

Components of electro-optical camera, which uses Kerr cell as shutter, are described; photographic record of electrical vaporization of fine wire taken with effective exposure time of 0.000,000,04 sec is shown; comments are made on ultimate possibilities and future applications of shutters for ultra high speed photography. (*EI*, 1949)

272. HIGH SPEED PHOTOGRAPHY
Quinn, H. F.
***The Engineering Journal*, v. 32, no. 9, pp. 544–549, September 1949**

Principle techniques defined; procedure with still, high speed movie, and drum cameras described; optical and electrical arrangement for multiple spark photography, detailed description of "Kerr Cell" and uses given, outlining properties and electronic aspects; synchronization of light flashes by mirrors for photographing projectiles in flight. (*EI*, 1949)

273. HIGH SPEED PHOTOGRAPHY
***Journal of the SMPE*, v. 52, Part 2, March 1949**

Papers presented at symposium held in Washington, DC, October 29, 1948. "Foreword," J. H. Waddell; "What Is High-Speed Photography," M. L. Sandell; "Electrical-Flash Photography," H. E. Eldgerton; "New High-Speed Stroboscope for High-Speed Motion Pictures," K. J. Germeshausen; "Lamps for High-Speed Photography," R. E. Farnham; "Motion Picture Equipment for Very High-Speed Photography," B. O'Brien and G. G. Milne; "Methods for Analyzing High-Speed Photography," W. S. Nivison; "New Developments in X-Ray Motion Pictures," C. M. Slack, L. F. Ehrike, C. T. Zavales and D. C. Dickson; "High-Speed and Time-Lapse Photography in Industry and Research," H. M. Lester; "Use of High-Speed Photography In Air Forces," E. A. Andres, Sr; "High-Speed Photography in Automotive Industry," R. O. Painter; "Applications of High-Speed Photography," M. Beard; "Control Unit for Operation of High-Speed Cameras," L. L. Neidenberg; "Lenses for High-Speed Motion Picture Cameras," A. A. Cook; "High-Speed Photographic System Using Electronic Flash Lighting," W. T. Whelan. (*EI*, 1949)

274. HIGH-SPEED PHOTOGRAPHY
***Journal of the SMPE*, v. 53, no. 5, pp. 431–603, November 1949**

"Motion Pictures in Guided-Missile Program," H. M. Cobb; "High-Speed Motion Picture Photography"; "High-Speed Motion Pictures by Multiple-Aperture Focal-Plane Scanners," F. E. Tuttle; "Improvements in High-Speed Motion Pictures by Multiple-Aperture Focal Plane Scanners," F. E. Tuttle; "Twenty-Lens High-Speed Camera," O. W. Wyckoff; "Half-Million Stationary Images per Second with Refocused Revolving Beams," C. D. Miller; "Very-High-Speed Drum-Type Camera," K. M. Baird and D. S. L. Durie; "Design of Rotating Prisms for High-Speed Cameras," J. H. Waddell; "Recent British Equipment and Technique for High-Speed Cinematography," G. A. Jones and E. D. Eyles; "Bowen Ribbon-Frame Camera," E. E. Green and T. J. Obst; "Physical Optic Analysis of Image Quality in Schlieren Photography," H. J. Shafer; "Exposure Meter for High-Speed Photography," E. T. Higgons; "Techniques in High-Speed Cathode-Ray Oscillography," C. Berkley and H. P. Mansberg; "Measuring Shock with High-Speed Motion Picture," J. T. Muller; "High-Speed Motion Pictures in Full Color," F. M. Tylee; "Water-Cooled High-Pressure Mercury Discharge Lamp for Direct-Current Operation," W. Elenbaas and E. W. van Heuven; "New View Finder for Faster Camera," A. L. Lidfeldt; "Report of High-Speed Photography Committee." (*EI*, 1949)

275. THE SCHMIDT OPTICAL SYSTEM
Rinia, H.
Bulletin de l'association suisse des électriciens, v. 40, pp. 580–585, August 20, 1949 (in English)

Various aberration types of different orders are discussed in detail. It is shown that O^5, O^4U and O^3U^2 (the latter called the lateral spherical aberration-being different in the two main planes) are particularly important—where O is aperture and U field angle. A full geometrical analysis of the coma and the lateral spherical aberration is presented, and the two different designs of the corrector plate by Bouwers and Maksutov and by Hawkins and Linfoot are described. (*EEA*, 1950)

276. AN ELECTRO-OPTICAL SHUTTER FOR PHOTOGRAPHIC PURPOSES
Zarem, A. M., Marshall, F. R., Poole, F. L.
Transactions of the American Institute of Electrical Engineers, v. 68, Part 1, pp. 84–91, 1949

277. AN ICONOSCOPE ELECTRO-OPTICAL SHUTTER FOR HIGH-SPEED PHOTOGRAPHY
Prime, H. A., Turnock, R. C.
Institute of Electrical Engineers, Measurements Section, Paper 1067
Proceedings of the Institution of Electrical Engineers, Part II, v. 97, no. 60, pp. 793–796, December 1950

The application of television techniques to high-speed photography. The system uses an iconoscope tube in which the photo-emission is controlled by the application of suitable potentials to the collector electrode. The charge image, formed during a chosen interval, is stored on the mosaic and subsequently scanned. Examples of exposure of various durations down to 2×10^{-6} second are shown. The mechanisms of spurious image formation during the "shutter-closed" period are discussed. The performance of the system is compared with that of a Kerr cell. (*AEI*, 1951)

278. MOTION PICTURE CAMERA DEVELOPMENT
Hill, G.
British Kinematography, v. 17, no. 4, pp. 105–116, October 1950

Features of various makes of cameras are described to illustrate advances that have been made; requirements of camera design; types of intermittent motion; magazine construction; lens systems employed; requirements of camera uses. (*EI*, 1951)

279. A MULTIPLE KERR CELL CAMERA
Zarem, A. M., Marshall, F. R.
Review of Scientific Instruments, v. 21, no. 6, pp. 514–519, June 1950

Optical and electrical systems of a high-speed shutter that employs the Kerr effect to photograph three stages of transient phenomena at framing rates that correspond to 40,000,000 frames/sec. (*AEI*, 1950)

280. A LOW COST 16 MM CAMERA FOR ROCKET PHOTOGRAPHY
Mueser, R. W., Irvine, T. F. Jr.
Journal of the American Rocket Society, pp. 119–125, September 1950

Modification of war-surplus GSAP camera to obtain film-transport speeds of over 100 frames/sec, and exposure times of less than 1/1000 of a second. (*AEI*, 1950)

281. OPERATION AND PHOTOGRAPHIC CHARACTERISTICS OF KERR-CELL TYPE OF ELECTRO-OPTICAL SHUTTER
Holtham, A. E. J., Prime, H. A.
Proceedings of the Physical Society, London, v. 63, no. 368B, pp. 561–572, August 1950

Electronically actuated shutter by which transmission of light can be controlled down to time of 10^{-8} sec; characteristics of shutter discussed from point of view of image formation and photometric analysis of results; investigations of growth of spark channel; determination of channel diameter and variation of radial intensity across spark. (*EI*, 1950)

282. LENS TESTER FOR PHOTOGRAPHIC LENSES
Back, F. G.
Review of Scientific Instruments, v. 21, no. 8, pp. 722–724, August 1950

Problems in testing lenses in simple, fast and accurate manner; advantages in use of lens tester which is basically modified autocollimator with built-in color filter

arranged in conjunction with assembly unit consisting of adjustable microscreen and lens holder; instrument makes possible immediate reading of results without further computation. (*EI*, 1950)

283. PLACE OF FRIESE-GREEN IN INVENTION OF KINEMATOGRAPHY
Cricks, R. H.
***British Kinematography*, v. 16, no. 5, pp. 156–163, May 1950**

Contribution made by William Friese-Green toward development of motion-picture camera; inventor's name appears on British Patent No. 10,131 entitled "Improved Apparatus for Taking Photographs in Rapid Series," application for which was made on June 21, 1899; it is claimed by some that Friese-Green is true inventor of Kinematography; details of his cameras. (*EI*, 1950)

284. A KERR CELL CAMERA AND FLASH ILLUMINATION UNIT FOR BALLISTIC PHOTOGRAPHY
Quinn, H. F., McKay, W. B., Bourque, O. J.
***Journal of Applied Physics*, v. 21, no. 10, pp. 995–1001, October 1951**
(*AEI*, 1951)

285. DIE ELEKTROTECHNIK IN DER ANGEWANDTEN FOTOGRAFIE
Frede, W.
***Elektrotechnikeren*, v. 3, no. 5, pp. 131–133, May 1951**

Electrical engineering in applied photography; survey of electrical devices used; use of lightmeters, photocell exposure regulators, color temperature measurements, new types of light sources, and electric remote-control cameras. (*EI*, 1952)

286. TRANSMISSION LINES KERR CELL
Beams, J. W., Morton, H. S.
***Journal of Applied Physics*, v. 22, no. 4, p. 523, April 1951**

287. ELECTRO-OPTICAL SHUTTERS FOR BALLISTIC PHOTOGRAPHY
Ley, B. J., Greenstein, P.
***Electronics*, v. 25, no. 9, pp. 123–125, September 1952**

Equipment developed for Kerr electro-optical shutters which gives either single pulse or ten identical pulses spaced 25, 50 or 100 msec apart; modified line modulator employing capacitor discharge through type 4C35 hydrogen thyratron and very low impedance load produces 50,000-v pip; circuit diagrams. (*EI*, 1952)

288. KERR CELL PHOTOGRAPHY AT HIGH SPEED PHENOMENA
Pugh, E. M., Heine-Geldern, R. V., Foner, S., Mutschler, E. C.
***Journal of Applied Physics*, v. 22, no. 4, pp. 487–493, April 1951**

Visible light photographs were obtained of metal jets squirted from lined conical cavities of high explosive charges; since jets travel through air at nearly meteoric velocities, their front ends are heated to incandescence and vaporized; remainder of jet is relatively nonluminous and is photographed by synchronizing Kerr cell shutter and exploding wire light source with phenomenon. (*EI*, 1951)

289. CAMERAS SEES LIKE MOVIE EYE
***Aviation Week*, v. 54, no. 13, pp. 32, 34, 36, March 26, 1951**

Transverse panoramic camera developed for air force by Perkin-Elmer Corp., Norwalk, Conn.; films great land masses with greater speed, economy and efficiency than possible heretofore; scanning prism sweeps wide field of view into fixed lens and onto film strip a mile long. (*EI*, 1951)

290. CONTINUOUS MOTION CAMERA FOR MULTIPLE EXPOSURE OF 35MM FILM
Webb, E. L. R.
***Canadian Journal of Technology*, v. 29, no. 9, pp. 401–405, September 1951**

Camera makes possible economical recording, at 4 in. per sec, of transient signals by method of photographing deflection modulated spot of cathode ray tube; it records 2000 ft of information on standard 100 ft roll of film.

291. RAPID-ACTION SHUTTER WITH NO MOVING PARTS
Edgerton, H. E., Wyckoff, C. W.
***Journal of the SMPTE*, v. 56, no. 4, pp. 398–406, April 1951**

Shutter in Rapatronic camera takes still exposures of 2 to 20μsec with high resolution; exposure is easily synchronized with fast transient event, and shutter has at least 30 deg viewing angle with apertures for high-speed photography: shutter is of magneto-optic "light valve" type, operating by rotation of plane of polarization of light. (*EI*, 1951)

292. MILESTONES IN DESIGN-MOTION PICTURE
Kremer, J.
***Machine Design*, v. 23, no. 2, pp. 154–157, February 1951**

Pictorial description of some of forerunners of such modern devices as NACA camera, used for study of engine knock, which can record images at 500,000 frames/sec. Mention is made of thaumatrope, zoetrope, Marey's photographic gun, praxinoscope, tachychope, kinematoscope, Edison's kinematographic camera, Lumiere intermittent film motion camera and other devices. (*EI*, 1951)

293. (KERR) ELECTRO-OPTICAL SHUTTERS FOR BALLISTIC PHOTOGRAPHY
Ley, B., Greenstein, P.
***Electronics*, v. 25, no. 9, pp. 123–125, September 1952**

294. ORIGINS OF PHOTOGRAPHIC INSTRUMENTS
Smith, F.
***Photographic Engineering*, v. 3, no. 3, pp. 145–160, 1952**

295. THE ELECTRONIC CAMERA IN FILM-MAKING
Collins, N., Macnamara, T. C.
***Institute of Electrical Engineers.* Paper 1354 (Television Convention), 1952**
***Journal of the SMPE;* v. 59, no. 60, pp. 445–457, December 1952**

The paper considers the cinematograph camera and assesses its inherent limitations. The advantages of the multiple camera are discussed, with special reference to the electronic camera; the recording of an electronic image is shown to be the culminating development. (*EEA*, 1952)

296. TIME PULSE NUMBERING SYSTEM FOR 16 MM MAGAZINE CAMERAS
Byers, R. C.
***Photographic Engineering*, v. 3, no. 4, pp. 207–209, 1952**

Application to phototracking of air-borne missiles is discussed.

297. THE SPECIFICATION AND MEASUREMENT OF THE SPEED OF HIGH APERTURE CAMERAS
Lindberg, P.
***Applied Scientific Research*, Part B, v. 3, no. 2, pp. 145–146, 1953**

The definition of camera aperture as ratio of exposure necessary when photographing an object to exposure necessary when the object is printed in contact has been experimentally determined. As the self-luminous object the opening in an enclosure giving a uniform brightness in all directions is employed. (*PA*, 1954)

298. PHOTOGRAPHIC SCIENCE AND TECHNIQUE
***Nature*, v. 171, pp. 1143–1144, June 27, 1953**

A report on a conference of the Scientific and Technical Group of the Royal Photographic Society held at Manchester in May 1953. Optical systems were described for photography in the special cases of measurement of objects at varied distances, of the illumination of cavities, and of high-speed work in furnaces. A method of high-speed photography by image dissection was described. Other papers dealt with cloud chamber work and the use of nuclear track plates, with references to emulsion behavior. Wider applications and principles were also considered. A useful paper discussed the legibility of print projected from lantern slides. (*PA*, 1954)

299. ELECTRONIC INSTRUMENTS FOR PRODUCTION TESTING OF CAMERA SHUTTERS
Lavender, R. W.
***Electrical Engineering*, v. 72, no. 4, pp. 336–340, April 1953**

Test instruments used for checking time synchronization between shutter switch contact "make" and opening of shutter aperture, equivalent energy transfer of "momen-

tary make" type of shutter switches, and instrument for checking life of shutters during production described; circuit diagram. (*EI*, 1953)

300. MONOCHROMATIC CAMERA FOR PHOTOGRAPHY IN THE FAR ULTRAVIOLET

Behring, W. E., et al.
***Journal of the Optical Society of America*, v. 44, pp. 229–231, March 1954**

An ultraviolet monochromatic camera has been constructed which avoids the use of quartz or lithium fluoride optics. The cameras make use of two gratings mounted in such a way that the dispersions neutralize. A description of the chromatic compositions of the image is given, and possible applications including the study of Solar limb-darkening in Lyman-α radiation, are discussed.

301. KERR CELL SHUTTER HAS SUBMICROSECOND SPEED

Nicholson, W. Q., Ross, I.
***Electronics*, v. 28, no. 6, pp. 171–173, June 1955**

How photographic exposures of 0.1μsec with effective aperture of f/7 are achieved by using Kerr-cell shutter with standard press camera; shutter is opened and closed by narrow 45-kv pulse from network transformer combination; circuit diagram. (*EI*, 1955)

302. CALIBRATION OF SHUTTER SPEEDS

van der Tweel, L. H., Keyman, J. Q.
***Applied Scientific Research*, Part B, v. 4, no. 4, pp. 244–260, 1955**

A number of focal plane and central-lens shutters were tested with a specially developed simple calibrating apparatus. (*PA*, 1955)

303. SCIENCE AND APPLICATIONS OF PHOTOGRAPHY

Schultze, R. S., ed.
***The Royal Photographic Society*, London, 1955**

Proceedings of the International Conference held in September 1953. 150 papers were presented under group headings as follows: Emulsion technology; Chemical sensitizing; Optical sensitizing; Latent image theory; Photographic effects; Theory of processing; Properties of the developed image; Sensitometry and densitrometry; Chemistry of non-silver halide processes; Photographic optics; Color correction and color masking; Investigations of color materials and processes; Color photography in practice; Kinematography; Photogrammetry, stereophotography; Radiography; Autoradiography; Nuclear track photography; Medical, biological and forensic photography; Photochemical processes; History, literature and documentation of photography; Photocopying techniques. (*PA*, 1955)

304. SHUTTER TESTER USING PHOTO-ELECTRIC INTEGRATOR

Hercock, R. J., Neale, D. M.
***Journal of the British I.R.E.*, v. 15, no. 11, pp. 565–575, November 1955**

Requirements for testing between-lens camera shutters; ideal instrument should combine photo-electric integrator with single sweep oscilloscope, two units operating simultaneously; instrument described which used vacuum tube voltmeter to measure voltage across integrating capacitor; methods of calibrating circuit; use of phantastron time base for oscilloscope. (*EI*, 1956)

305. UNIVERSAL SHUTTER TESTER

Wessel, A. B.
***Electronics*, v. 29, no. 2, pp. 162–163, February 1956**

Need has existed for photographic shutter tester that measures between-lens and focal-plane type shutters with equal facility; features of suitable direct-reading device which measures camera shutter speed deviation in accordance with ASA rating method; circuit incorporates d-c amplifier that has no drift with heater voltage variations of up to 1 v; circuit diagram. (*EI*, 1956)

306. TITANIUM SHUTTER

***Light Metal Age*, v. 14, p. 32, June 1956**

307. EASTMAN THE AMATEUR: BRADY THE HISTORIAN: BOOK REVIEWS

Collings, J. L.
***Editor and Publisher*, v. 88, p. 46, December 3, 1955**

308. HISTORY OF PHOTOGRAPHY

Gernsheim, H., Genssheim, A.
Review by J. R. Newman
***Scientific American*, v. 194, pp. 133–138, May 1956**

309. MICRODENSITOMETER FOR PHOTOGRAPHIC RESEARCH
Altman, J. H., Stultz, K. F.
Review of Scientific Instruments, v. 27, pp. 1033–1036, December 1956

310. TECHNICAL OPPORTUNITIES IN 16 MM AND 8 MM FIELD
Maurer, J.
Journal of the SMPTE, November 1956

311. RAPID-CLOSING ELECTRONICALLY-OPERATED SHUTTER
Edgerton, H. E., Strabala, F. I.
Review of Scientific Instruments, v. 27, no. 3, p. 162, March 1956

A shutter that closes quickly for capping drum cameras is described. A density of 3 is obtained in about 30μsec by the sudden evaporation of a network grid of small lead wires. Energy for the evaporation and control of the operation instant are accomplished by a charged capacitor and a series hydrogen thyratron respectively. (*PA*, 1956)

312. TELE-OBJECTIVE OF 500 MM FOCAL LENGTH AND REFLEX CAMERA UNIT
Revue d'optique, v. 35, no. 8–9, pp. 492–494, August–September 1956 (in French)

313. EFFECT OF PRISM ON LOCATION OF PRINCIPLE POINT
Washer, F. E.
Photogrammetric Engineering, v. 23, no. 3, pp. 520–532, June 1957

Method whereby effective prism angle and displacement of principle point can be determined from analysis of asymmetric values of distortion for case of camera properly aligned for calibration; theoretical analysis of problem and results are confirmed by experiment. (*EI*, 1957)

314. IMPROVED 'ROVING EYE'
British Broadcasting Corp. Engineering Division, BBC Engineering Monograph, no. 12, April 1957
Engineer, v. 20, no. 5277, pp. 412–413, March 15, 1957

New mobile television camera units known as Mark II designed as small, self-contained, two camera unit; vehicle used is shortened Karrier "Bantam" chassis fitted with body built to BBC design. (*EI*, 1957)

315. MINIATURE CAMERA CALIBRATOR—ITS DESIGN, DEVELOPMENT AND USE
Avera, H. Q.
Photogrammetric Engineering, v. 23, no. 3, pp. 601–607, June 1957

Design of calibrator for miniature cameras using achromatic triplet lens as collimeter objective lens; resolution target utilizes 14 elements to give resolution of from 1 to 75 lines per mm for long focal length lenses and from 50 to 4000 for short focal length lenses. (*EI*, 1957)

316. A NEW AUTOMATIC IRIS CONTROL FOR MOTION PICTURE CAMERAS
La Rue, M. W. Jr.
Journal of the SMPTE, v. 66, pp. 413–416, July 1957

The Bell & Howell Co.'s new design camera incorporated a self-powered compact iris (automatic) control. Mechanical power to drive the lens' iris originates from a small direct-current, permanent-magnet motor driven by mercury batteries. A photo-voltaic cell deflects a relay meter according to average scene brightness, and opening or closing the motor-battery circuit causes the lens' iris to be properly positioned. The camera and its method of use are described.

317. ANAMORPHIC LENS SYSTEM
Rosin, A. S.
Journal of the SMPTE, v. 66, pp. 407–409, July 1957

An anamorphic lens known as "Scanscope" has been developed for use in motion pictures and television. The optical design is described, showing how the aberrations are controlled over a field angle of 80 deg or more. A unique coupling arrangement allows this lens to be used interchangeably with camera lenses of different focal length in a unit focus arrangement. Application of this system is described.

318. ELECTROPHOTOGRAPHY USING PHOSPHORS
Fridkin, V. M., Gerasimova, T. N.
Doklady Akademii Nauk, SSSR, v. 113, no. 3, pp. 571–572, 1957 (in Russian)

319. ELECTROPHOTOGRAPHY OF PHOTOELECTRETS
Fridkin, V. M.
Kristallografiya, v. 2, no. 1, pp. 130–133, 1957 (in Russian)

320. REMARKABLE OPTICAL ELECTRONIC LIGHT AMPLIFYING TECHNIQUE CALLED THE CAT EYE
Radio & TV News, v. 58, p. 14, July 1957; also in *Electrical Engineering*, v. 76, p. 754, August 1957

321. ANAMORPHIC LENS SYSTEM: SCANOSCOPE
Rosin, S.
Journal of the SMPTE, v. 66, pp. 407–409, July 1957

322. MYRIATRON IMAGE DISSECTOR FOR HIGH-SPEED PHOTOGRAPHY
Lunn, G. H., Chippendale, R. A.
Electronic and Radio Engineer, v. 34, pp. 156-160, May 1957

323. PORTABLE POWER SUPPLY FOR HIGH-SPEED CAMERAS
Peterson, D. H., Currie, N. G.
Journal of the SMPTE, v. 66, pp. 618–621, October 1957

324. RECENT DEVELOPMENTS IN PHOTOGRAPHIC PROCEDURES AND TECHNIQUES IN ACIC
Hedden, R. T.
Photogrammetric Engineering, v. 24, no. 1, pp. 70–74, March 1958

Includes a description of instruments which rectify 9×18 in. photographs, and the development of a technique which permits the rectification of trimetrogen obliques on the B and L Rectifier.

325. LOOK BACK AT THE FIRST CANDID CAMERA
Jackson, D.
Modern Photography, v. 22, pp. 62–63, August 1958

326. DETECTION OF NUCLEAR EXPLOSIONS IN SPACE POSSIBLE BY OPTICAL MEANS
Coric, S.
Missiles and Rockets, pp. 32–33, August 3, 1959

Two spectroscopes mounted in a satellite is proposed as a method of surveillance.

B. Reports

327. THEORETICAL INVESTIGATION OF A LIQUID-MERCURY SHUTTER
Kreisman, W. S.
Boston University, Physical Research Labs Technical Note, 135, November 1957
AF 33(616)3405
AD 155,231

The theory of liquid-metal shutters has been approached from the point of view of magnetohydrodynamics. In particular, the motion of a thin sheet of mercury under simultaneous electrical and magnetic forces has been considered. (ASTIA TAB U58)

328. IMAGE PROCESSING
Kovasznay, L. S. G., Joseph, M. H.
Commerce Dept., National Bureau of Standards, R-4108 (*Proceedings of the Institute of Radio Engineers*, v. 43, no. 5, May 1955, pp. 560–570)

The major objective of the present study was the development of a method for processing pictures by electronic techniques, similar to those used in television with emphasis upon the realization of a few important operators.

329. THE KERR CELL AS AN ULTRA HIGH FREQUENCY OPTICAL SHUTTER
I. THEORETICAL ANALYSIS
Clark, G. L., Holshouser, D. F., Von Foerster, H. M.
Illinois, University of, Electrical Engineering Research Laboratory, March 1955
TR-1-1, AF 18(600)1018
AD 59,191

330. AN INTEGRAL REPRESENTATION OF THE ELECTROMAGNETIC FIELD IN THE IMAGE SPACE OF AN OPTICAL SYSTEM
Wolf, E.
New York University, Institute of Mathematical Sciences, Division of Electromagnetic Research
Report EM-112

Preliminary to the study of the structure of an optical image from the standpoint of electromagnetic theory, an integral representation is obtained, for the electromagnetic field in the image space of an optical system. This representation, which is not restricted to systems of low angular aperture, is in the form of an angular spectrum of plane waves, and is closely related to that introduced by Luneberg as a vector generalization of well-known formulas of Debye and Picht.

331. MULTIPLE IMAGE PRINTING FOR PLANETARY PHOTOGRAPHY
Kirby, F. S.
July 25, 1958
RAND Corp.
P-1446

This paper discusses some features of the multiple image printing method for making planetary photographs which offers one solution of minimizing the losses otherwise obtained.

C. Books

332. HISTORY OF PHOTOGRAPHY FROM 1839 TO THE PRESENT DAY
Newhall, B.
Doubleday and Co., Inc., New York, 1952

III. ASTRONOMICAL PHOTOGRAPHY

A. Periodicals

333. APPLICATIONS OF THE HELIOMETER TO ASTRONOMICAL PHOTOMETRY
Trembolt, R.
Comptes rendus hebdomadaires des séances de l'académie des sciences, v. 199, pp. 1294–1295, December 3, 1934

In order to determine the difference of magnitude of two stars close together on the celestial sphere, the heliometer is adjusted so that the stars appear to come from the two halves of the objective; two semi-circular areas are then perceived by the eye, which are uniformly illuminated by the two sources to be compared. By placing a calibrated wedge in the focal plane of the path of the brighter source (the images must first be slightly separated) and adjusting the intensity by means of a compensating wedge, it is possible to obtain uniformity of illumination of the field and hence calculate the relative magnitudes of the stars. The method is also described for converting the instrument into one which may be used for photographic photometry. (*PA*, 1935)

334. PHOTOGRAPHIC STELLAR PHOTOMETRY
Lallemand, A.
Bulletin astronomique, v. 9, no. 7–9, pp. 447–454, 1934

An investigation is made of the properties of photographic images taken at the focus; within the whole circle which defines the image the illumination impressed on the plate is high enough for saturation and the luminous flux over an area practically equal to the normal dimensions of focal images is read and the entire density of the small portions thus formed is measured. A description of the methods of Fabry, Schilt, and Liau is given where the plate is at a short distance from the focus, and improvements and suggestions are made. Artificial points of light for a magnitude scale are used which are obtained by placing a screen pierced by a hole of 0.3 mm dia. before an acetylene jet flame under constant pressure. By means of small achromatic lenses of 7 cm focus, placed side by side 2 m from the hole, the beams traverse a neutral glass whose thickness is computed so as to form a convenient scale, but the glass is not actually in contact with the plate. The microphotometer gives measures of density, nearly to 0.001, and the precision obtained is limited only by dust, defects in the emulsion, and the intrinsic properties of the photographic plate. (*PA*, 1936)

335. PHOTOGRAPHIC STELLAR PHOTOMETRY
de Saussure, M.
Bulletin astronomique, v. 9, no. 6, pp. 311–347, 1934

Different methods used for determining photographic magnitudes are reviewed, some of which need two separate exposures for each star, and some of which suffer

from loss of light. A new method is explained in detail which is an adaptation, with modifications, of that for determining color indices. Its advantages are: (1) simultaneous single exposure for the two star images to be compared; (2) applicability to measurement either of diameters or intensities of images; (3) absence of prism or any optical device in front of the objective; and (4) satisfactory accuracy of the results obtained. (*PA*, 1936)

336. SOLARIZATION OF LOW INTENSITY

Reardon, A. J., Griggs, H. P.

***Journal of the Optical Society of America*, v. 24, pp. 331–338, December 1934**

After briefly discussing previously published results on the phenomenon of photographic reversal, the results obtained during a period of 2½ years examination of the solarization region are given. The camera consisted of a long box with a 0.5 cm opening at one end covered with a piece of ground photographic plate glass, and the plate carrier at the other end is divided into four sections each capable of holding a 9×12 cm plate. In front of each plate is placed a metal diaphragm containing 5 rows of 11 holes, with each row covered by a metal strip so that the holes can be uncovered one by one. Lamps of 400 and 1000 W were used as light sources, and all plates were developed for 5 min at $65 \pm 1°$F. The results given show that the solarization curve beyond the second reversal contains a set of maximum and minimum points, the distances between adjacent maxima or minima increasing with increasing exposure time. In one case 16 reversals were obtained during an exposure time of 1759 hr. The age of the emulsion also affects the results, decreasing both the density resulting from the development of the latent image and the solarization effect. (*PA*, 1935)

337. STELLAR PHOTOGRAPHIC-PHOTOMETRY BY C. FABRY'S METHOD

Grouiller, H.

***Comptes rendus hebdomadaires des séances de l'académie des sciences*, v. 199, pp. 1583–1585, December 26, 1934**

In all photographic-photometric methods, precision is limited because of the deformed images to be measured. In the method described, a small photographic chamber of short focus is placed behind the focal plane of the objective, giving an image of this objective on the plate, and a diaphragm in the focal plane limits this to the region of the sky to be used. Thus a circular disc with a defined border and a very uniform density is obtained on the plate. The illumination of the plate depends on the square of the focal distances of the telescope and of the little photographic chamber, and objectives of long focus are advantageous. Such an instrument installed on the Equatorial Coudé of the Lyon Observatory (aperture 32 cm, focal length 780 cm) is described and a curve from 153 observations of the Cepheid, R. T. Aurigae (period 3.73 years) whose maximum magnitude is 5.3, and minimum 6.6 is given. In spite of unfavorable conditions the error of an individual measurement did not exceed $\pm 0^m.031$, and constitutes the most precise record of the star. (*PA*, 1935)

338. PROBLEMS AND PROGRESS IN PHOTOGRAPHY

Bloch, O.

***Nature*, 135, pp. 89–92, January 19, 1935. Course of 3 lectures delivered at the Royal Institute, October and November 1934**

After briefly considering the widely different requirements for astronomy, work with α-particles and protons, and work with atomic rays and in the extreme ultra-violet, the internal problems of the subject are discussed. The points considered are the complex functions of gelatin in emulsion making, the action of light on the silver halides including the effect of S compounds in the gelatin, development, mode of expressing speed, resolving power, graininess, and finally optical sensitizing. (*PA*, 1935)

339. PHOTOGRAPHIC PLATES FOR USE IN SPECTROSCOPY AND ASTRONOMY. PART IV

Mees, C. E. K.

***Kodak Research Laboratory*, Comm. No. 487; in *Journal of the Optical Society of America*, v. 25, pp. 80–83, March 1935; also in *Photographic Journal*, v. 75, pp. 188–190, April 1935**

The three characteristics – sensitivity, contrast and graininess – of each of the five emulsions previously described all change systematically in the same direction in going from type I to type V. When type IV emulsions are sensitized to produce type R sensitivity it is found that the plates have a high R sensitivity corresponding to

type I. The emulsion is therefore designated by three separate figures, the first referring to the sensitivity, the second to the contrast and the third to the graininess, the figures indicating the type of unsensitized emulsion possessing the qualities referred to. Advances in the production of polycarbocyanine dyes has resulted in a considerable simplification in the preparation and handling of type Q plates and in two new infrared sensitisings. One—type M—gives an emulsion with a strong maximum at λ9300, the spectrum extending from λ8000 to λ10,000 and with much greater sensitivity than type Q, the other—type Z—has a sensitivity maximum at λ10,900, and extends up to λ12,000. Wedge spectrograms for types M, Q and Z sensitizing, and a diagram of the spectral sensitivity region of spectroscopic plates including the most recent advances, are given. (*PA*, 1935)

340. PHOTOGRAPHIC MOONLIGHT RECORDER

Williams, C. B., Emery, G. A.

***Journal of Scientific Instruments*, v. 12, pp. 111–116, April 1935**

The paper describes a photographic recorder for moonlight. It consists of a cylindrical lens mounted on a light-tight drum which rotates at a speed of one revolution in 24 hr and 50 min, which is the average time of the Moon's apparent rotation round the Earth. The axis of the drum is set each afternoon so that the lens follows the position of the Moon. Inside the rotating drum is a fixed drum on the outer surface of which is a strip of photographic bromide paper. On this the line image of the Moon, produced by the cylindrical lens, is focused. The darkening of the bromide paper gives an indication both of the duration and of the intensity of the moonlight. (*PA*, 1935)

341. PHOTOGRAPHIC PLATES FOR SCIENTIFIC PHOTOGRAPHY

Weichmann, H. K.

***Zeitschrift für wissenschaftliche Photographie*, v. 34, pp. 136–147, June 1935**

This paper deals with the properties of the Agfa spectrum plates, considering in particular their use with visible light in spectroscopic, astronomic and similar measurements. This is followed by a section dealing briefly with Agfa ultra-violet plates, after which the varied types of Agfa infra-red plates are considered. Finally, development and over-sensitizing are briefly considered. (*PA*, 1935)

342. PHOTOGRAPHIC RECORDING

Lüdemann, K.

***Zeitschrift für Instrumentenkunde*, v. 56, pp. 63–71, February 1936**

A summary is given of the advantages of photographic recording in astronomy (stellar and other measurements), meteorology (balloon theodolite), and air track conditions (kinetheodolite). Special appliances with this object for land measurements, for surveying, and determining latitude, longitude, and height are discussed and shown to be preferable to older methods. (*PA*, 1936)

343. PHOTOGRAPHIC PHOTOMETRY

Ross, F. E.

***The Astrophysical Journal*, v. 84, pp. 241–269, October 1936**

A thermoelectric photometer is described and the theory of photometric measurement is developed. The influence of variable fog on the photographic plate, including the Eberhard effect, is investigated. It is shown that, in general, the ratio of the galvanometer deflection for the star to that for the fog in the immediate neighborhood is a measure of stellar magnitude. Experimental evidence is adduced. Since the standards of magnitude (the Polar Sequence) are located at the pole, the effect on photometry of the unavoidable errors of adjustment of the polar axis of the instrument, especially serious in long exposures, are pointed out and steps which should be taken for their reduction are suggested. The difficulties always met in the photometric measurement of plates taken with wide-angle lenses—in particular, distance errors—are discussed. The background effect, due to unresolved clusters and to dark and bright nebulae, is shown to be inappreciable. Experiments were made to determine the best method of development. It was found, unexpectedly, that development without rocking or agitation of any kind gave superior results. A catalogue of the magnitudes and approximate positions of all stars as bright as 12.0 photovisual magnitude in the BD zones 88 deg and 89 deg is given, with a chart for identification. Comparison is made with Seares' values for normal distribution and mean color indices. (*PA*, 1936)

344. MEASURING APPARATUS FOR PHOTOGRAPHIC PLATES UP TO 240 mm × 240 mm
Ritter, H.
Zeitschrift für Instrumentenkunde, v. 56, pp. 196–210, May 1936

A description of the construction and testing of a plate measuring machine taking astronomical plates up to 24 cm × 24 cm. (*PA*, 1936)

345. APPLICATIONS OF PHOTOGRAPHY TO SCIENTIFIC AND TECHNICAL PROBLEMS
Bloch, O. F.
Journal of the Royal Society of Arts, v. 85, no. 4410, pp. 651–672, May 28, 1937

A discussion of the application of photography to astronomy, high speed photography, aerial photography, and television.

346. SLIT SPECTROGRAPH FOR DIFFUSE GALACTIC NEBULAE
Struve, O.
Astrophysical Journal, v. 86, pp. 613–619, December 1937

A spectrograph has been constructed which consists of a wide slit, attached to the outside of the upper end of the tube of the 40-in. telescope, and an f:1 Schmidt camera of 94 mm aperture with two 60 deg quartz prisms. Very faint nebulae can be observed with this instrument, provided their diameters exceed 11 ft. (*PA*, 1938)

347. TOTAL LUNAR ECLIPSE, MOTION PICTURES
Christee, W. H., Miller, W.
Journal of the Royal Astronomical Society of Canada, v. 32, pp. 401–404, November 1938

Pictures were taken of the lunar eclipse of May 23, 1938, which occurred at midnight on the Pacific coast. They used the 10-in., f:25 Cooke refractor on an Eastman Panchromatic Super X Standard Motion-Picture film in conjunction with a No. 29 by 12 filter which limits light to a narrow region of the red spectrum; exposure times were 1/50 sec for the uneclipsed Moon and 5 sec for Earth-limb portion (which was dark as lunar eclipses go). The film speed was reduced to 1 ft/min or a 90-times reduction. A plate is given of the eclipsed Moon. (*PA*, 1939)

348. CELESTIAL KINEMATOGRAPHY
Petrie, R. M.
Journal of the Royal Astronomical Society of Canada, v. 33, pp. 33–38, February 1939

This is a description of the evolution of motion-picture cameras directly attached to a telescope, from 1927 to the present time: for shadow changes in lunar craters; Jupiter's belts; stellar occultations by the Moon; the solar eclipse of 1932; and, especially, rapid solar changes. This last has proved a valuable research, with special problems of technique, since the final projected picture is greatly magnified, and a following rather than a guided telescope is required. On the Moon the "terrain" near mountains and crater walls can be explored, and proper levels found; on the Sun, the short lived spots, prominences, and granules can be examined together. There are two plates given. (*PA*, 1939)

349. SURFACE OF NEAREST STAR
McMath, R. R.
Journal of the SMPE, v. 32, pp. 264–279, March 1939

Work done at the University of Michigan is described. (*EI*, 1939)

350. SENSITOMETRIC STUDY OF DEVELOPERS AND EMULSIONS OF ASTROPHYSICAL INTEREST
Barber, D. R.
Monthly Notices of the Royal Astronomical Society, v. 100, pp. 180–188, January 1940

An investigation is described in which the influence of 3 different developers upon 9 dissimilar emulsions is examined from an astrophysical standpoint. Values of background (chemical) fog, contrast factor, and effective sensitivity, at different density levels, have been derived from microphotometer measures of plates exposed in a tube sensitometer. The influence of the developing agent upon the quantities enumerated is discussed for the various emulsions tested. A series of diagrams is reproduced to illustrate graphically the change in the effective response of the emulsion at different densities, expressed as a magnitude gain, or loss, referred to standard development. Comparisons are made of the graininess of the developed image for each of the emulsion-developer combinations. These have been derived from microphotometer tracings at a constant density level of 0.5. It is concluded that the standard methol-hydroquinone devel-

oper is the most suitable for use in astronomical photography. It is capable of yielding negatives of excellent quality when used in combination with a wide range of emulsion types. (*PA*, 1939)

351. COLOUR INDEX AND TEMPERATURE OF THE SOLAR CORONA

Righini, G., Atti, R.

Accademia d'Italia, Rome, *Classe di scienze fisiche, matematiche e naturali—memorie*, v. 14, no. 8, pp. 75–93, 1943 (in Italian)

The selective absorption and reflectivity of lenses, filters and mirrors of a long focus eclipse camera were measured. Color index and temperature of the corona photographed with this equipment are obtained. A possible explanation of the observed fall of the temperature in the middle corona is proposed. (*PA*, 1949)

352. REMARKS ON THE TECHNIQUE OF DIRECT SUN PHOTOGRAPHS OBTAINED WITH LONG-FOCUS INSTRUMENTS

Von Klüber, H., Müller, H.

***Zeitschrift für Astrophysik*, v. 24, no. 3–4, pp. 207–222, 1948 (in German)**

Description of a new photographic shutter-arrangement, used successfully in connection with the Potsdam Solar Tower, and of a method for the quick determination of heliographic co-ordinates. (*PA*, 1948)

353. RECENT ADVANCES IN ASTRONOMICAL CAMERA DESIGN

Linfoot, E. H.

***The Photographic Journal*, v. 88B, pp. 58–64, May–June 1948**

A historical survey on lens systems used for astronomical photography is given. The Schmidt camera is fully discussed and modifications described. A modern technique for making corrector plates of moderate size and recent advances in camera design are given. (*PA*, 1949)

354. LYMAN-ALPHA-LINE PHOTOGRAPHED IN THE SUN'S SPECTRUM

Pitenpol, W. B., et al.

***Physical Review*, v. 90, p. 156, April 1, 1953**

A complex automatic, electronic and mechanical sun-seeking device has been developed during the past three years at the Physics Dept. of the University of Colorado, intended for installation on high altitude rockets. It is now used to hold spectrographic equipment pointing at the Sun. On December 12, 1952 for the first time, the ultraviolet hydrogen radiation of the Sun was photographed far beyond the previous limit of 2000 Å.

355. THE EFFECTIVE QUANTUM EFFICIENCY IN ASTRONOMICAL SPECTROSCOPY

Argyle, P. E.

***Journal of the Royal Astronomical Society of Canada*, v. 49, no. 1, pp. 19–26, January–February 1955**

An estimate of the effective quantum efficiency of fast emulsions used in astronomical spectroscopy is made by comparing the actual performance of the Kodak 103aO emulsion with the calculated performance of an "ideal" emulsion whose performance is limited only by the signal-to-noise ratio in the starlight itself. It is found that the ideal emulsion would be seven magnitudes faster than the 103aO. An electronic method of obtaining spectra that shows promise of greater efficiency than photographic methods, at least in certain wavelength regions, is briefly described and some preliminary results are mentioned. (*PA*, 1955)

356. THE POSSIBILITY OF DISCOVERING NEBULAE AND FAINT STARS

Lallemand, A., Duchesne, M.

***Comptes rendus hebdomadaires des séances de l'académie des sciences*, v. 241, no. 4, pp. 360–362, July 25, 1955 (in French)**

Limitations of present photographic methods in current use with the largest telescopes are discussed; and it is suggested that, because of its relatively high sensitivity to photo-electrons, very high resolution, and virtual absence of granularity, Kodak Maximum Resolution emulsion should be of great value in satisfactorily recording photo-electron images of very faint astronomical objects, otherwise undetectable. Exposure times would be comparable to those required with standard techniques. (*PA*, 1955)

357. ROYAL OBSERVATORY

***Engineering*, v. 180, no. 4691, pp. 858–859, December 23, 1955**

Report giving further details of transfer of observatory and disposal of major astronomical equipment.

358. ELECTRONIC PHOTOGRAPHY OF STARS
Baum, W. A.
Scientific American, v. 194, pp. 181–182, March 1956

359. TELEVISION TECHNIQUES IN OBSERVATIONAL ASTRONOMY
Somes-Charlton, B. V.
British Communications and Electronics, v. 3, no. 4, pp. 192–196, April 1956

Television techniques can be applied (a) for fast photography of planets, (b) for astrophysical measurements on stars and the intensification of very faint images, (c) for stellar spectroscopy, particularly in the ultraviolet and far infrared regions. Up to the present time, most of the practical work at Cambridge has been on items (a) and (c) as much useful knowledge could be obtained by the use of Pye standard television-camera equipment operating under closed-circuit conditions. With equipment such as the 12-in. refractor telescope at the Dunsink observatory, Dublin, a large increase in sensitivity is obtained, so that exposure times can be correspondingly reduced and greater definition obtained in the image. Photographs of part of the Moon's surface by direct photography and by television technique are shown which illustrate this. Similar results have been obtained in tests carried out on the planets Jupiter and Saturn. Experiments are in progress with a view to reducing still further the exposure time by using a television system operating on 525 lines at 100 frames/sec sequentially, without interlace. Synchronization of the television rate-of-scan with the operation of a photographic shutter should then make it possible for pictures to be taken off the television screen with an exposure of 0.01 sec. (*PA*, 1956)

360. THE ROLE OF PLATE SATURATION IN THE LIMITATION OF THE (STAR) MAGNITUDES ATTAINED BY CLASSICAL PHOTOGRAPHY AND WITH THE AID OF THE ELECTRON TELESCOPE
Vernier, P.
Comptes rendus hebdomadaires des séances de l'académie des sciences, v. 242, no. 8, pp. 1006–1008, February 20, 1956 (in French)

The 5-metre telescope at Mt. Palomar cannot photograph stars weaker than magnitude 24 because of photographic plate saturation caused by the general sky background. It should be possible by using an electron telescope to increase the number of developed grains in the plate per incident photon and so reduce the statistical fluctuations in this background. By making certain simplifying assumptions, it is calculated that an electron telescope of unity magnification and 10% cathode efficiency fitted to the Mt. Palomar telescope, should enable stars of magnitude 27 to be detected with exposures of a few hours. (*PA*, 1956)

361. TELEVISION IN THE SERVICE OF SCIENCE
McGee, J. D.
Television Society Journal, v. 8, no. 2, pp. 47–58, April–June 1956

In astronomy, it is stated that the quantum efficiency of the photoelectric effect is at least two orders of magnitude greater than that of the photographic effect, giving a better "signal/noise" ratio and thus detecting fainter objects.

362. RAPID SEQUENTIAL PHOTOGRAPHY OF THE SOLAR PHOTOSPHERE AND SPOTS
Roosch, J.
Comptes rendus hebdomadaires des séances de l'académie des sciences, v. 243, no. 5, pp. 478–480, July 30, 1956 (in French)
(*PA*, 1957)

363. AN F/2 CASSEGRAIN CAMERA
Meinel, A. B.
Astrophysical Journal, v. 124, no. 3, pp. 642–644, November 1956

Utilization of this camera with the 82 in. McDonald telescope and the 40 in. Yerkes refractor would indicate that this camera's system could be used with advantage on many existing telescopes. (*PA*, 1957)

364. SOLAR GRANULATION AND ITS OBSERVATION FROM A FREE BALLOON
Blackwell, D. E., et al.
Nature, v. 180, pp. 211–213, August 3, 1957

To counter the effects of low-level atmospheric turbulence on the resolution obtainable in direct photography of the solar disc at ground-level stations an attempt has

been made to photograph the Sun with an airborne camera suspended below a piloted balloon. (*PA*, 1957)

365. CONTINUOUS BALANCE PHOTOELECTRIC GUIDER FOR STAR CAMERA
Weitbrecht, R. H.
Review of Scientific Instruments, v. 28, pp. 122–124, February 1957

366. POWERFUL STRATOSCOPE PROMISES PHOTOS THREE TIMES SHARPER THAN ANY TAKEN BEFORE
Product Engineering, v. 28, pp. 26–27, October 7, 1957

367. A FAST AURORAL CAMERA
Montalbetti, R.
Canadian Journal of Physics, v. 35, no. 3, pp. 280–283, March 1957

A movie camera is described which photographs auroral displays at a speed of one or more frames per second. (*PA*, 1957)

368. CAT EYE TO VIEW MARS
Journal of the Franklin Institute, v. 263, pp. 573–574, June 1957

ARDC, Westinghouse, and RCA have developed a transducer which eliminates "jitters."

369. CAMERAS RECORD FLIGHT OF SATELLITE AND METEORS
Industrial Laboratories, v. 9, pp. 68–69, June 1958

370. RECORDING OF TIME DURING THE PHOTOGRAPHY OF ARTIFICIAL EARTH SATELLITES
Lipskii, Yu M.
Astronomicheskii Zhurnal, v. 35, no. 2, pp. 301–304, 1958

371. NEW FILM TO TAKE CLOSE LOOK AT MARS: KODAK SPECTROSCOPIC FILM, TYPE IV-G
Industrial Laboratories, v. 9, p. 13, July 1958

372. MINIATURE MOVIES OF THE PLANETS
Baker, S. C., Kelso, J. M.
Astronautics, v. 4, no. 5, pp. 26–28, 104, May 1959

B. Reports

373. EXPERIMENTS FROM A LUNAR VEHICLE
Johnson, M. H.
April 28, 1958
Air Force Dept. Air Research and Development Command Office of Scientific Research, Meetings—2Astronautics, Paper—2 (Data Publications 2ASTRO—2) (Projects: Space Technology)

Possible experiments from a lunar vehicle are discussed. These include trajectory measurements by radar for determining more accurately the gravitational fields of the Earth and Moon, experiments for verifying impact of the vehicle on the Moon, optical and infrared camera experiments, meteor analysis, ion probes, measurement of the magnetic moment of the Moon, and determination of cosmic radiation.

374. THE MOTION PICTURE PHOTOGRAPHY OF METEORS (METHODOLOGICAL PROPOSALS)
Astapovich, I. S.
Air Technical Intelligence Center, Wright-Patterson AFB, 1954 ATIC-262978; F-TS-8986/III
AD 128,661

375. METHODS OF APPLYING CELESTIAL OBSERVATIONS TO METRIC PHOTOGRAPHY
Bendixen, A. C.
December 14, 1956
Redstone Arsenal, Huntsville, Ala.
Report 3M111P
AD 117,749

A group of papers is presented which describe applications and examples of celestial observations. Notes are given on the use of astronomical tables in the American Ephemeris and Nautical Almanac. A procedure is outlined to determine the camera focal length, or principal distance, and the principal point which is the point on the film plane where the normal intersects the film plane, usually near the center. The principal distance is determined for the entire lens-cone-film plane assembly as it

is to be used in the field; it is not necessarily identical with the lens focal length when the lens is bench-calibrated before being mounted in the camera body. Calibration of the camera interior elements is done with the lens mounted as it would be for actual data records. With appropriate conditions, star traces for calibration may be imaged at the same time a trajectory is imaged. Camera interior elements are assumed known; survey data for camera and target positions, if any, are required; and approximate camera azimuth and zenith are needed to assist in star identification if stars are to be used as targets. (ASTIA)

376. METEOROLOGICAL UTILIZATION OF IMAGES OF THE EARTH'S SURFACE TRANSMITTED FROM A SATELLITE VEHICLE
Glaser, A. H.
October 31, 1957
Harvard University, Blue Hill Meteorological Observatory, Report AFCRC TR-57-241, Contract AF 19(604)1589
AD 146,764

The potential meteorological use of satellites is inspected. Consideration is given to (1) picture quality (gross structure, fine structure, and total gradation) of the transmitted picture, (2) image orientation, (3) the variations in illumination and brightness of the Earth and clouds, (4) the recognition of cloud forms from the satellite, (5) synoptic significance of cloud forms, and other meteorological problems. With foreseeable technological developments, the image resolution is limited to about 1 mi by the communication channel capacity. Some 30 to 50 gradations of brightness may be distinguished in a typical feasible system. (ASTIA TAB U58)

377. UNMANNED PHOTOGRAPHIC EXPEDITION TO THE MOON
Collins, J. J., Johnson, R. W., et al.
May 1958
Massachusetts Institute of Technology, Instrumentation Laboratory, Cambridge, Mass.
R-T-162, v. 1

The vehicle and equipment requirements to accomplish photographic examination of the normally unseen side of the Moon are considered. Trajectory studies are reported, and equipment designs are presented.

378. MULTIPLE IMAGE PRINTING FOR PLANETARY PHOTOGRAPHY
Kirby, D. S.
RAND Corp., Santa Monica, California
p-1446, July 25, 1958

This paper discussed some features of the multiple image printing method for making planetary photographs which offers one solution to minimizing losses due to various causes.

C. Books

379. PHOTOGRAPHIC GIANTS OF PALOMAR
Fassero, J. S.
Westernlore Press, Los Angeles, Calif., 1952

380. HANDBOOK FOR OBSERVING THE SATELLITES
Howard, N. E.
Thos. Y. Crowell Co., New York, 1958

381. SKYSHOOTING
Mayall, R. N. and M. L.
The Ronald Press Co., New York, 1949

IV. TELEVISION DEVELOPMENT

A. Periodicals

382. A DEVELOPMENT IN THE PROBLEM OF TELEVISION
Langer, N.
Wireless World, v. 11, no. 169, pp. 197–201, November 11, 1922

Some experimental work is described.

383. TELEPHOTOGRAPHY
Belin, E.
Technique Moderne, v. 15, no. 14, pp. 417–426, July 15, 1923

384. THE BERLIN TELESTEREOGRAPHY, FOR THE TRANSMISSION OF PHOTOGRAPHS AT A DISTANCE
Calfas, P.
Génie Civil, v. 82, no. 16, pp. 365–370, April 21, 1923

385. AN ACCOUNT OF SOME EXPERIMENTS IN TELEVISION
Baird, J. L.
Wireless World, v. 14, no. 6, pp. 153–155, May 7, 1924

386. TELEVISION
Langer, N.
Wireless World, v. 13, no. 25 and 26, March 19 and 26, 1924

An account of the work of D. Mihaly.

387. TELEVISION
Engineer, v. 137, no. 3563, pp. 385–386, April 11, 1924

A description of the Swinton system.

388. ELECTRICAL TRANSMISSION OF PICTURES
Electrical World, v. 83, no. 24, pp. 1223–1224, June 14, 1924

389. THE PROBLEM OF ELECTRICAL SEEING AT A DISTANCE
Voss, A.
Elektrotechnischer Anzeiger, v. 41, no. 104–107, June 28, July 1, 3, and 5, 1924

A description of the Voss systems.

390. TELEVISION
Baird, J. L.
Wireless World, v. 15, no. 17, pp. 533–535, January 21, 1925

A description of the Baird system.

391. THE TELEHOR, AN ELECTRIC TELEVISION APPARATUS
Diner-Dénes, P.
Zeitschrift des Vereins Deutscher Ingenieure, v. 66–69, no. 48, pp. 1507–1508, November 28, 1925

392. PHOTO-TELEGRAPHY AND TELEVISION
Kollatz, C. W.
Engineering Progress, v. 6, no. 10, pp. 309–313, October 1925

The most important methods to date are described.

393. TRANSMISSION OF PICTURES OVER WIRES
Cook, T. T.
Military Engineer, v. 17, no. 96, pp. 498–502, November–December 1925

The Western Electric method is reviewed.

394. TRANSMISSION AND RECEPTION OF PHOTORADIOGRAMS
Ranger, R. H.
Telegraph and Telephone Age, no. 22, pp. 517–525, November 16, 1926

A review of the art of electrical picture transmission from its inception, over 80 years ago, to date.

395. HIGH-SPEED PHOTO-TELEGRAPHY
Fischel, P. J. G.
Wireless World, v. 18, no. 21, pp. 777–779, June 9, 1926

A description of the work of Dr. Karolus of Telefunken Company.

396. TELEVISION
Baird, J. L.
Experimental Wireless, v. 3, no. 39, pp. 730–739, December 1926

The effect of Selenium on television development, especially Baird's work.

397. TELEVISION APPARATUS
Dinsdale, A.
Wireless World, v. 18, no. 18, pp. 642–645, May 5, 1926

A description of Jenkins' apparatus which uses prismatic rings to pass a beam of light.

398. TELEGRAPHY OF LIVING IMAGES
Freund, B.
Elektroteknisk Tidsskrift, v. 38, no. 33, pp. 369–271, November 3, 1925

A description of the Berthold-Freund system.

399. TELEVISION ACCORDING TO BELIN SYSTEM
Génie Civil, v. 89, no. 25, pp. 549–552, December 18, 1926

The picture is swept by a very intense luminous ray; displacing itself so fast that all points of the image are lighted successively in less than $\frac{1}{10}$ sec. Displacement of the ray is obtained by two oscillating mirrors following two perpendicular directors. (*EI*, 1927)

400. DEVELOPMENT OF TELEVISION, THE LATEST MARVEL OF THE AGE
Alexanderson, E. F. W.
New York Railroad Club, Proceedings of the, v. 37, no. 6, pp. 8331–8337, May 1927

401. TELEVISION DEVELOPMENTS
Engineering, v. 124, no. 3214 and 3215, pp. 247–250, August 19, 1927; pp. 281–283, August 26, 1927

Papers presented to the A.I.E.E. at Detroit.

402. TELEVISION
Baird, J. L.
Journal of Scientific Instruments, v. 4, no. 5, pp. 138–143, February 1927

A review of the problems involved and some possible solutions.

403. TELEPHOTOGRAPHY AND TELEVISION
Dantine, C.
Génie Civil, v. 92, no. 13, pp. 301–306, March 31, 1928

A survey of existing systems.

404. TELEVISION, A MOVING MOSAIC
Jones, P. C.
Stone and Webster Journal, v. 42, no. 3, pp. 339–346, March 1928

Explains different types of apparatus in use.

405. TELEVISION, 1873–1927
Television, v. 1, no. 1, pp. 10–11, 23, March 1928

A brief outline of accomplishments in this field over the last half century.

406. TELEVISION, PAST AND FUTURE
Swinton, A. A. C.
Discovery, v. 9, no. 107, pp. 337–339, November 1928

407. TELEVISION
Baker, T. T.
Electromet Review, v. 103, no. 2643, pp. 96–98, July 20, 1928

A description of mechanical methods of scanning is included.

408. ACTUAL STATUS OF TELEPHOTOGRAPHY
Industrie Électrique, v. 37, no. 859, pp. 151–155, April 10, 1928

A review of the general principles involved, and a description of the different systems in use at present.

409. PICTURE TELEGRAPHY
Post Office Electrical Engineers Journal, v. 21, Part 3, pp. 191–199, October 1928

This article includes: a description of the sending apparatus; the Siemens-Carolus system; receiving apparatus; the Bell system; transmission methods; and a bibliography.

410. PHOTO-TELEGRAPHY
Baker, T. T.
Electromet Review, v. 103, no. 2647, pp. 263–266, August 17, 1928

A brief description of the electro-optical and mechanical systems of transmission and receiving.

411. RECENT PROGRESS IN TELEPHOTOGRAPHY AND TELEVISION
Korn, A.
Deutsche Optische Wochenschrift, v. 14, no. 44, pp. 605–607, October 28, 1928

412. ACTUAL STATE OF TELEVISION
Valensi, G.
Pratique des Industries Mécaniques, v. 10, no. 12, pp. 485–493, March 1928

A description of the apparatus used in sending and receiving, and some of its first applications.

413. IMAGE TRANSMISSION BY RADIO WAVES
Goldsmith, A. M.
IRE, Proceedings of the, v. 17, no. 9, pp. 1536–1539, September 1929

This is an introductory series of papers which describe specific methods to carry out radio transmission of stationary or moving objects.

414. A QUANTITATIVE ANALYSIS OF TELEVISION
Harries, J. H. O.
Television, v. 2, no. 15, pp. 105–112, May 1929; pp. 259–260, 272, July 1929

Various aspects of television transmission and receiving are discussed.

415. THE LITERATURE OF TELEVISION
Harries, J. H. O.
Television, v. 2, no. 19, pp. 345–351, September 1929

A list of works of reference and where they may be found; brief summary and details of the reference system used by the author.

416. TELEVISION, PRESENT AND FUTURE
Fleming, A.
Engineering, v. 79, no. 3348, p. 343, March 14, 1930

417. TELEVISION SYSTEMS
Jenkins, C. F.
Journal of the SMPE, v. 15, no. 4, pp. 445–450, October 1930

418. THE TRANSMISSION OF TELEVISION IMAGES
Farnsworth, H. E., Lubcke, H. R.
Projection Engineer, v. 2, no. 9, pp. 21–23, September 1930

419. USUAL WORKING PROCESSES IN TELEVISION
Kette, G.
Fernsehen, v. 1, no. 5, pp. 220–226, May 1930

A survey of historical developments.

420. HISTORICAL DEVELOPMENT OF TELEVISION
Friedel, W.
Fernsehen, v. 1, no. 1, pp. 12–17, January 1930

Notes on the development from 1875 to date.

421. FUNDAMENTAL SYSTEMS OF ELECTRICAL TRANSMISSION OF MOTION PICTURES
Thun, R.
Fernsehen, v. 1, no. 6, pp. 267–273, June 1930

422. TELEVISION (FJERNSYN)
Heegaard, F.
Elektroteknikeren, v. 26, no. 8, pp. 141–150, April 22, 1930

A description of different types of apparatus used.

423. FACSIMILE PICTURE TRANSMISSION
Zworykin, V.
IRE, Proceedings of the, v. 17, no. 3, pp. 536–550, March 1929; pp. 895–898, May 1929

424. NEW TYPE OF TELEVISION
Telephone Engineering, v. 34, no. 4, p. 33, April 1930

Westinghouse review, new type of television; use of cathode-ray tube as receiver adds many advantages.

425. TELEVISION, SOME SUGGESTED SCHEMES
Lewin, E. G.
Television, v. 2, no. 23, pp. 554–561, January 1930

426. ELECTRICAL TRANSMISSION OF PICTURES BY RADIO
Niwa, Y., Kobayoshi, M.
Journal of the Institute of Electrical Engineers, Japan, no. 501, pp. 343–355, April 1930
(in Japanese)

427. PHOTOTELEGRAPHY
Ritter, E. J.
Post Office Electrical Engineering Journal, v. 23, Part 1, pp. 1–8, 9, April 1930

Some notes on the apparatus installed and rates involved.

428. PICTURE TELEGRAPHY
Hirsch, R.
Far East Review, v. 26, no. 11, pp. 642–643, November 1930

A solution for the rapid sending of Chinese and Japanese characters without numerical codes.

429. PICTURE TELEGRAPHY TO BERLIN
Electronics, v. 104, no. 2693, pp. 31–33, January 10, 1930

The system in use is described, including the Kerr cell condenser, the synchronizing and phasing, and the conditions governing good reproduction.

430. TELEPHOTOGRAPHY AND TELEVISION
Bonfante, J.
Electricien, v. 61, no. 1495, pp. 295–297, July 1, 1930

431. TELEPHOTOGRAPHY OVER WIRES
Holstrom, J. G.
Teknisk Tidsskrift, v. 60, no. 14, pp. 65–72, April 5, 1930

A description of the installation in Sweden.

432. DEVELOPMENTS IN TELEVISION
Mitchell, W. G.
Journal of the Royal Society of Arts, v. 79, no. 4096, pp. 616–642, May 22, 1931

A definition of television; résumé of present practice, scanning and other problems.

433. DIE ENTWICKLUNG DES FERNSEHENS
Fuchs, F.
Deutsches Museum Abhandlungen und Berichte, v. 3, no. 5, pp. 159–188, 1931

A review of historical developments.

434. ROMANCE OF TELEVISION
Vipond, L. C.
Projection Engineer, v. 3, no. 4, pp. 17–18, April 1931

A review of the beginning of television engineering and its progression to its present state.

435. TECHNIQUE OF TELEVISION
Singh, K.
Electronic Times, v. 80, no. 2080, pp. 349–352, September 3, 1931

Outline of the principles, mathematics, and equipment involved.

436. TELEVISION
Oil-Power, v. 5, no. 12, pp. 180–186, January 1931

A review of progress and equipment; diagrammatic representation of scanning.

437. TELEVISION PROGRESS FROM THE ENGINEERING VIEWPOINT
Weiller, P. G.
Radio Engineering, v. 12, no. 3, pp. 16–17, 32, March 1932

438. LA TÉLÉVISION
Devillez, R.
Bulletin de la société belge des électriciens, v. 49, pp. 1–20, January 1933

Historical development and various processes; photoelectric cells; scanning discs; scanning mirrors, cathode ray tubes, etc.

439. BRIEF HISTORY OF KINETOGRAPH, KINETOSCOPE, AND KINETOPHOTOGRAPH
Kickson, W. R.
Journal of the SMPE, v. 21, pp. 435–455, December 1933

440. DESCRIPTION OF AN EXPERIMENTAL TELEVISION SYSTEM AND THE KINESCOPE
Zworykin, V. K.
IRE, Proceedings of the, v. 21, pp. 1655–1673, December 1933

441. ULTRA-RAPID KINEMATOGRAPH
Bull, L., Girard, P.
Comptes rendus hebdomadaires des séances de l'académie des sciences, v. 202, pp. 554–555, February 17, 1935

The main difficulty with hf kinematograph images is their separation. In this case a modification of the Henriot and Huguenard principle is employed to get perfect stability of the rotor. The film, 22 cm in length, is placed inside the rotor with the emulsion directed to the centre. The shutter is regulated to the same speed as the rotor. It is possible to obtain 5×10^4 images per sec with perfect distinctness and clarity in this way. (*PA*, 1936)

442. APPARATUS FOR ACCELERATED KINEMATOGRAPHY
Bronn, O., Alexandrov, V.
Technical Physics, USSR, v. 4, no. 5, pp. 370–376, 1937 (in English)

A simple and cheap apparatus for accelerated kinematography is described, capable of taking 24 successive photographs with exposures as small as 1/100,000 sec. It has been used for the study of the extinction of electric arcs, and stereoscopic photographs may also be obtained. (*PA*, 1937)

443. FERNSEHEN, 1938
Winckel, F. W.
Zeitschrift für Fernmelde technik werk-und Gerätbau, v. 19, no. 9, pp. 137–141, September 15, 1938

Television in 1938; illustrated description of present status and recent progress. (*EI*, 1939)

444. COAXIAL CABLE SYSTEM FOR TELEVISION TRANSMISSION
Strieby, M. E.
Bell System Technical Journal, v. 17, pp. 438–457, July 17, 1938

445. TELEVISION ENGINEERING
Everest, F. A.
Communications, v. 19, nos. 4–9, April–September 1939

Contents: April, Fundamental principles, analysis, summary; May, Frequency bandwidths; June, Television cameras; July, Cathode-ray tubes; August, Electron beam deflection methods; September, Synchronization; bibliography.

446. RECENT PROGRESS IN TELEVISION
Kirke, H. L.
Royal Society of Arts, v. 89, no. 4498, pp. 302–327, February 3, 1939

General principles; scanning; definitions, etc.

447. UBER DIE TECHNIK DER ELEKTRISCHEN BILDSPEICHERUNG
Krawinkel, G., and Boedeker, H.
Telegraphen-Fernsprech-Funk u Fernseh-Technik, v. 29, no. 2, pp. 37–44, February 1940

Concerning the technique of electrical picture storage.

448. DETERMINATION OF OPTICAL NUMBER OF LINES IN TELEVISION SYSTEM
Kell, R. D., et al
RCA Review, v. 5, no. 1, pp. 8–30, July 1940

449. TELEVISION
Tremain, W. E.
Journal of the Institute of Electrical Engineers, London, v. 86, no. 521, pp. 460–470, May 1940

Notes on general development.

450. STORAGE IN TELEVISION RECEPTION
Rosenthal, A. H.
Electronics, v. 14, no. 10, pp. 46–49, 115–116, October 1941

451. COLOUR TELEVISION. I.
Goldmark, P. C., Dyer, J. C., Hollywood, J. M.
IRE, Proceedings of the, v. 30, pp. 162–182, April 1942; also in *Electronic Engineering*, v. 15, pp. 195–200, October 1942

A brief history of color television and the reasons leading up to the Columbia Broadcasting System color television system are presented. A general theory of color television, including color, flicker and electrical characteristics, is also given. Equipment for color-television transmission and reception has been designed and constructed based on these principles. (*EEA*, 1943)

452. TELEVISION PICTURE STORAGE
Rosenthal, A. H.
Television Society Journal, v. 3, no. 8, pp. 199–203, 1942

New method of electronic storage excitation of television receiving screen is described.

453. COLOUR TELEVISION
Goldmark, P. C., Dyer, J. N., Piore, E. R., Hollywood, J. M.
Television Society Journal, v. 3, no. 9, pp. 227–243, 1942

454. TELEVISION TODAY
Frank, J., Jr.
International Projectionist, v. 18, no. 10, 11, 12, 1943

Contents: October, Theory of operation of vacuum-tube; November, Amplifier, photoelectric cell; and December, Cathode-ray tube; comparison with some form of radio communication.

455. TELEVISION TODAY
Frank, J., Jr.
International Projectionist, v. 19, nos. 1–10, 1944

Contents: January, Iconoscope; February, Image dissector; March, Film projectors for television; April, Television transmitters; May, Radio relays.

456. TELEVISION TODAY
Frank, J., Jr.
International Projectionist, v. 19, nos. 1–10, 1944

Contents: January, Iconoscope; February, Image dissector; March, Film projectors for television; April, Television transmitters; May, Radio relays; June, July, Reproducers; August, Television receivers; September and October, Color television.

457. REFLECTIVE OPTICS IN PROJECTION TELEVISION
Maloff, I. G., Epstein, D. W.
Electronics, v. 17, pp. 98–195, December 1944

458. TELEVISION DEVELOPMENTS
Wireless World, v. 51, no. 12, pp. 371-372, December 1945

459. PYE "VIDEOSONIC" TELEVISION SYSTEM
Lawson, D. I.
Electronic Engineering, v. 17, no. 214, pp. 814-815, December 1945

460. NAVAL AIRBORNE TELEVISION RECONNAISSANCE SYSTEM
Shelby, R.E., Somers, F. J., Moffett, L. R.
RCA Review, v. 7, pp. 303–337, September 1946

A high fidelity long range television reconnaissance system developed for the US Navy is described. The Project Ring equipment was designed for multi-camera attended operation at 20 frames/sec, 40 fields/sec, 567 lines/frame interlaced and uses a 5 mc/s video bandwidth. A high power (1,400 W. peak) airborne television transmitter is employed. The maximum plane-to-ground transmission range attained during tests was over 200 mi. Very consistent operation with satisfactory signal/noise ratio has been obtained with this equipment at ranges of 100 mi or more with the aircraft flying at altitudes of 7,000–10,000 ft. (*EEA*, 1947)

461. TELERAN. AIR NAVIGATION AND TRAFFIC CONTROL BY MEANS OF TELEVISION AND RADAR
Ewing, D. H., Smith, R. W. K.
RCA Review, v. 7, pp. 601–621, December 1946

462. TELEVISION EQUIPMENT FOR GUIDED MISSILES
Shall, C. J., Katz, L.
Proceedings of the Institute of Radio Engineers and Waves and Electrons, v. 34, pp. 375–401, June 1946

A brief history of the technical problems associated with the development of compact airborne television equipment is outlined. The system provides resolution, linearity and stability which approaches that obtained from broadcast equipment. Technical difficulties which arose after the completion of the equipment design are described. The final solution of these and other problems resulting from its installation in guided missiles is discussed. Photographs taken from the receiver screen during experimental flights are shown. (*EEA*, 1946)

463. CHARACTERISTIC BASIS OF TELEVISION
Indian Engineering, v. 120, no. 3, pp. 153–154, September 1946

Summary of the development of television and its optical and physical bases.

464. SIMPLE OPTICAL METHOD FOR SYNTHESIS AND EVALUATION OF TELEVISION IMAGES
Graham, R. E., Reynolds, F. W.
IRE, Proceedings of the, v. 34, no. 1, pp. 18W–30W, January 1946

Use of a 35 mm motion picture projection and line screen is described for projection of pictures similar to television.

465. NAVAL AIRBORNE TELEVISION RECONNAISSANCE SYSTEM
Shelby, R. E., et al
RCA Review, v. 7, no. 3, pp. 303–307, September 1946

466. TELEVISION RECONNAISSANCE
Electronic Industries, v. 5, no. 5, pp. 80–81, 165–167, May 1946

467. TELEVISION EQUIPMENT FOR AIRCRAFT
Trainer, M. A., Poch, J.
RCA Review, v. 7, pp. 469–502, December 1946

The RCA 1848 small iconoscope made possible the design of miniature television equipment, the application of which to aircraft use is discussed. The system operates at 100 mc/s with a bandwidth of 4.5 mc/s, using double sideband working to simplify controls, and has a range of 10 miles. All units work from a 12-v dc supply. Frame and line frequencies are approx. 40 and 14000 c/s with a sync. signal simplified by the use of sequential scanning instead of interlacing. The 3 units in the aircraft comprise the camera-transmitter-containing iconoscope, amplifiers, time bases, rf section and power equipment, a 7-in. tube picture monitor which may be connected in place of the rf output valve to permit periodic monitoring, and a dynamotor supplying power to these two units. The receiver incorporates a 7-in. tube and is completely self-contained, operating from a 12-v dc source. Microphonics, power supply variations, interference from ignition and radar equipment and multipath transmission when working from one aircraft to another are discussed. (*EEA*, 1947)

468. SURVEYING RECENT TELEVISION ADVANCES
Batcher, R. R.
Electronic Industries, v. 5, no. 10, pp. 46–48, October 1946

Illustrated description of improvements and progress in major television equipment and components as outgrowth of war; discussion includes cameras and pickup tubes, airborne transmitters, receiver design, so-called Schmidt projection system, color apparatus, and other phases of television engineering. (*EI*, 1947)

469. REPORT ON CBS 490-MC COLOR TELEVISION
FM and Television, v. 6, no. 2, pp. 21–27, February 1946

Data is given on a film scanner and transmitter; rf problems and other difficulties are reviewed.

470. TRANSMISSION OF TELEVISION SOUND ON PICTURE CARRIERS
Fredenhall, G. L., et al
IRE, Proceedings of the, pp. 49P–61, February 1946

471. TELEVISION
Zworykin, V. K.
Franklin Institute Journal, v. 244, no. 2, pp. 131–146, August 1947

Description of principle and apparatus with data on image orthicon, flying spot scanner, reflective projection

system and theater television projector; stationary picture signal generator and demonstration equipment. (*EI*, 1947)

472. TELEVISION: 20th ANNIVERSARY
Ives, H. E.
***Bell Laboratories Record*, v. 25, no. 5, pp. 190–193, May 1947**

Brief review of television history, with particular reference to researches carried on by H. E. Ives and others associated with Bell Laboratories; first circuit between New York and Washington in March 1927; prior developmental work dating back to 1925 relating to transmission of pictures by telephone wire; discussion of some of transmission problems involved and contributions of various individuals in solving them. (*EI*, 1947)

473. HISTORICAL DEVELOPMENT OF SOUND FILMS
Sponable, E. I.
***Journal of the SMPE*, v. 48, nos. 4 and 5, pp. 275–303, April 1947, pp. 407–422, May 1947**

Technical contributions leading to commercialization of sound motion pictures; evaluation of progress made by inventors and others associated with various stages of sound development. (*EI*, 1947)

474. PROGRESS IN TELEVISION
Town, G. R.
***Electronic Engineering*, v. 66, no. 6, pp. 580–590, June 1947**

Background of status quo in standardization of television is reviewed, and contributions of National Television System Committee and Radio Technical Planning Board, and wartime developments evaluated. In outlining immediate future of television, due consideration is given to commercial problems, and predictions are made about the course color television will follow in view of recent FCC decision. (*EI*, 1947)

475. HISTORICAL DEVELOPMENT OF SOUND FILM
Sponable, E. I.
***International Projectionist*, v. 22, no. 7–12, July–December 1947; v. 23, no. 1, January 1948.**

476. REPORT OF SMPE COMMITTEE ON PROGRESS
Wolfe, W. W.
***Journal of the SMPE*, v. 48, no. 4, pp. 304–316, April 1947**

Developments in motion picture field during and since war with particular reference to cinematography, sound recording, television application, studio lighting equipment, British documentary movement, feature film production in Great Britain, and film production in Mexico. (*EI*, 1947)

477. SAMPLE COMPUTATIONS FOR SPATIAL RESECTION AND SPACE ORIENTATION
Quinn, A. O.
***Syracuse University Bulletin*, no. 17, p. 27, April 1947**

Procedure and examples of its use given; reader is assumed to have only vague reading acquaintance with subject and theory of spatial problems. (*EI*, 1948)

478. PLASTIC OPTICAL SYSTEMS FOR TELEVISION
***Nature*, London, v. 160, pp. 99–100, July 19, 1947**

479. A NEW MICROWAVE TELEVISION SYSTEM
Wentz, J. F., Smith, K. D.
***Transactions of the American Institute of Electrical Engineers*, v. 66, pp. 465–470, 1947**

Describes an FM system operating between 3900 and 4400 mc/s. More than one channel may be used, each accommodating a 4–5 mc/s video signal. Shielded lens or parabolic reflector aerials are used with filters for radiating more than one frequency from each. FM is achieved by applying modulation voltage to the transmitter tube repeller electrode giving 0.4 W. rf output. Aerial gains are approx. 35 db. Block schematics and photographs are given for transmitter and receiver. Power supply is highly stabilized with a 2-stage dc amplifier to prevent modulation of the transmitter. Circuit details are given of crystal rectifiers in the receiver and of the limiter and discriminator. (*EEA*, 1948)

480. AN EXPERIMENTAL SIMULTANEOUS COLOR TV SYSTEM
Staff, R.C.A.
***IRE, Proceedings of the*, v. 35, pp. 861–867, September 1947**

481. TÉLÉVISION ET SES APPLICATIONS: HISTORIQUE ET SITUATION ACTUELLE
Le Duc, J.
***Société des Ingenieurs Civils de France, Mémoirs*, v. 100, no. 7–8, pp. 414–420, July–August 1947**

Television and its applications; history and present status; description of experimental television station in Montrough, France; television equipment; photographs. (*EI*, 1959)

482. TÉLÉVISION ET SES APPLICATIONS: QUELQUES PROGRÊS RÉCENTS
Vassy, E.
***Société des Ingenieurs Civils de France, Mémoirs*, v. 100, no. 7–8, pp. 421–431, July–August 1947**

Television and its applications; recent progress; data on iconoscope and orthicon; television installations during war on ships and in ports; diagrammatic drawings, photographs. (*EI*, 1949)

483. ELECTRO-OPTICAL CHARACTERISTICS OF TELEVISION SYSTEMS.
Schade, O. H.
***RCA Review*, v. 9, 5–37, March 1948**

The optical and electro-optical conversion processes in television systems are examined as intermediate stages of a multi-stage process by which optical information at the real object is "transduced" into sensory "response" at the brain. The characteristics of the human eye and vision in the final stage of this process determine the requirements and standards for preceding stages. When expressed on a unified basis by "transfer" and "aperture response" characteristics, the properties of the process of vision can be correlated with those of external imaging and transducing processes. It is shown that image definition, or the corresponding information from optical or electrical image-transducing stages, can be specified by the characteristics which may be computed and measured for all components of the system. Quantitative data from measurements permit definite quality ratings of optical and electrical components with respect to theoretical values. A subjective rating of the resolution in an imaging process external to the eye such as a television system is derived by establishing a characteristic curve for the relative "sharpness" of vision as affected by the "aperture response" of the external imaging process. Viewing angle, sensation characteristics, color response, persistence of vision, flicker, resolving power, response characteristics, and steady and fluctuating brightness distortions are discussed and related to the characteristics of external imaging systems and the television process. (*EEA*, 1948)

484. REPORT OF SMPE PROGRESS COMMITTEE
***Journal of the SMPE*, v. 50, no. 6, pp. 523–542, June 1948**

Survey of more important technical progress made by motion picture industry during 1947 is classified as follows: cinematography, sound recording, picture and sound reproduction, television, and standards; developments relating to 35, 16, and 8-mm films are discussed. (*EI*, 1948)

485. HISTORICAL SKETCH OF TELEVISION'S PROGRESS
Lankes, L. R.
***Journal of the SMPE*, v. 51, no. 3, pp. 223–229, September 1948**

Review of published material on various aspects of television which will affect photographic industry. (*EI*, 1948)

486. ELECTRO-OPTICAL CHARACTERISTICS OF TELEVISION SYSTEMS
Schade, O. H.
***RCA Review*, v. 9, no. 2, 3, 4, pp. 245–286, June 1948; pp. 490–530, September 1948; pp. 653–686, December 1948**

June: Electro optical specifications for television. September: Characteristics of camera systems. December: Properties of Imaging systems. Bibliography. (*EI*, 1949)

487. OPTICAL PROBLEMS IN LARGE-SCREEN TELEVISION
Maloff, I. G.
***Journal of the SMPE*, v. 51, no. 30–6, July, 1948**

A short survey of the RCA auditorium projection system (7-in. cathode ray tube, operated at 50 kv into a Schmidt optical system with a 21-in. mirror and a 14½-in. aspherical correcting lens), giving a 6x8 ft picture, and of the larger theatre type system (15-in. cathode ray tube

at 80 kv and a Schmidt system with a 42-in. mirror and 30-in. aspherical correcting lens) for a screen of 18x24 ft. The latter optical system is the largest Schmidt projector in existence. (*PA*, 1949)

488. REPORT OF SMPE PROGRESS COMMITTEE
***Journal of the SMPE*, v. 52, no. 5, pp. 580–596, May 1949**

Explanation of organization, functions, and activities of Motion Picture Research Council, Inc; brief résumé of Council's history and reasons for its reorganization. (*EI*, 1949)

489. HISTORICAL SKETCH OF TV PROGRESS
Lankes, L. R.
***International Projectionist*, v. 24, no. 1, pp. 11, 26–28, January 1949**

490. THE EFFECT OF THE TRANSMITTED FREQUENCY BAND ON THE QUALITY OF THE TELEVISION PICTURE. III-IV.
Schunack, J.
***Archiv der elektrischen Ubertragung*, v. 4, pp. 75–81, February 1950; pp. 113–120, March 1950 (in German)**

An exact mathematical treatment is given of resolution problems when dealing with rectangular pulse, checkerboard and sinusoidal picture patterns. The principal differences between distortion effects due to the geometry of the resolving aperture and those due to frequency cutoffs are discussed. It is shown that the optimal product of aperture width of transmitter and cut-off frequency of the transmission system should be as small as possible and can be corrected by circuit means within the passband. On the other hand, it is shown that at the receiver end it is not possible to correct for a dropping hf characteristic, i.e. that the amplifier response at hf, although attenuated by the aperture, should be maintained at full level. (*EEA*, 1950)

491. DISTANT ELECTRIC VISION
McGee, J. D.
***IRE, Proceedings of the*, v. 38, pp. 596–611, June 1950; also in *IRE, Proceedings of the*, Australia, v. 10, pp. 211–224, August 1949**

An outline of the history of television is followed by a detailed description of the design and development of some English television pickup tubes. (*EEA*, 1950)

492. TELEVISION IN DENMARK
Heegaard, F.
***Ingeniøren*, v. 59, pp. 866–869, October 28, 1950**

Preliminary broadcasting on an experimental scale is described and the discussions on the various systems, line numbers and frequency, are reported, with comments. General features of the Danish transmission proposed are given. (*EEA*, 1951)

493. INDUSTRIAL TELEVISION AND VIDICON
Zworykin, V. K.
***Electronic Engineering*, v. 69, no. 7, pp. 624–627, July 1950**

Consideration of applications of television outside field of entertainment and description of vidicon pickup tube which, because of its compactness and high sensitivity, makes them possible. (*EI*, 1950)

494. PROGRESS COMMITTEE REPORT
***Journal of the SMPTE*, v. 54, no. 5, pp. 525–544, May 1950**

Advances noted by the Society of Motion Picture & Television Engineers committee in survey of motion picture, sound recording and television field; what has been done toward achieving greater economy in film production, provision of more screen light intensity, application of motion picture studio techniques to television, and solution of other current problems. (*EI*,1950)

495. TELEVISION TODAY
Brodine, A. M.
***Compressed Air Magazine*, v. 55, no. 6, pp. 144–149, June 1950**

Historical review of developments leading to present status; principle of transmission and reception; patent data; coaxial carrier cable; microwave relay stations; cathode ray tubes; output of receiving sets. (*EI*, 1950)

496. VIDEO PROGRAM RECORDER
Gillette, F. N., King, G. W., White, R. A.
***Electronics*, p. 90, October 1950**

497. TELEVISION OPTICS
Back, F. G.
***Tele-Vision Engineering*, v. 1, no. 4, pp. 4–7, April 1950**

Characteristics of optical systems developed recently to provide normal long distance and extra long distance closeups, as well as pickups in dimly lit areas, and test patterns which can be used to align cameras rapidly; particulars of Zoomar, Reflectar and Balowstar equipments with cross sections showing optical design. (*EI*, 1950)

498. PORTABLE MICROWAVE TELEVISION RADIO LINK
***Engineer*, v. 190, no. 4932, p. 128, August 4, 1950**

Equipment developed by Standard Telephones and Cables, Ltd. is essentially a frequency modulator, super-high-frequency system employing carriers of order of 4000 mc and operating between points within visual range of each other and not more than 30 mi apart; except in case of permanent receiving terminals, equipment is designed for use in motor van. (*EI*, 1950)

499. STORING VIDEO INFORMATION
Hopper, A. L.
***Electronics*, v. 24, pp. 122–125, June 1951**

Comparison of signal amplitudes along adjacent television scanning lines can be made by storing the video information of one line for 63.5 μsec. This is achieved by employing a fused silica bar working in the shear wave transmission mode. Quartz crystals with 18 mc/s fundamental frequency serve as transducers, the delay line operating on the 3rd harmonic. Delay time, power loss and bandwidth of the storage system are calculated, and the complete circuit diagram of the apparatus is shown. (*EEA*, 1951)

500. TELEVISION IMAGE KINEMATOGRAPHY
Kemp, W. D.
***British Kinematography*, v. 19, no. 2, pp. 36–50, August 1951**

Problems of photographing television images for purpose of obtaining motion picture film which can be retransmitted at later date; particular emphasis is placed upon tone reproduction side of television recording process, since correct tone reproduction (with adequate contrast range) is probably greatest single quality factor; results of tests made to investigate transfer characteristics of all processes from television camera to final print of finished "Telefilm." (*EI*, 1951)

501. TV FIELD EQUIPMENT MAINTENANCE
Ledbetter, J. B.
***Tele-Vision Engineering*, v. 2, no. 7, pp. 20–21, 29, July 1951**

Methods of obtaining maximum performance from remote camera chains with aid of comprehensive checkup program; camera, viewfinder and camera control checks; checking sync generator; suggestions regarding typical troubles. (*EI*, 1951)

502. ANALYSIS OF DOT-SEQUENTIAL COLOR TELEVISION
Marchand, N., Holloway, H. R., Leiffer, M.
***IRE, Proceedings of the*, v. 39, no. 10, pp. 1280–1287, October 1951**

Mathematical analysis of pulse sampling and sorting processes is presented; color distortion and cross talk introduced by sideband clipping of sampled color functions is examined; color multiplexing arrangement using sinusoidal functions is described which can produce results equivalent to pulse sampling and sorting method, and which is more economical circuitwise than pulse sampling (*EI*, 1951)

503. PROGRESS COMMITTEE REPORT
***Journal of the SMPTE*, v. 56, no. 5, pp. 568–583, May 1951**

Advances in 1950 noted by Society's committee in field of 16-mm and 35-mm photography, picture and sound recording and reproduction, and television; examples of some types of equipment developed. (*EI*, 1951)

504. A CONTINUOUS MOTION SYSTEM FOR TELEVISING MOTION PICTURE FILMS
Lucas, W. P., Holman, H. E.
***Proceedings of the Institution of Electrical Engineers*, London, v. 99, pp. 95-108, April–May 1952**

505. TELEVISION
Kerkhof, F., Werner, W.
Philips, Gloeilampen-Fabrieken, Eindoven, Holland, 1952
Available in U.S. through Elsevier Press Inc., Houston, Texas

Primarily for technicians and engineers with knowledge of radio theory, book gives physical principles on which television is based, develops numerous and varied electrical circuits employed in design of modern receivers and transmitters, discusses systems used in U.S. and in use or projected in Great Britain and Continent; glossary of terms and bibliography. (*EI*, 1953)

506. TELESCRIBE
Gilbert, G. A.
Tele-Vision Engineering, v. 3, no. 4, pp. 14–17, April 1952

System using television or radar type equipment for direct transmission of material upon plate glass sheet which is scanned by reflection; flying-spot scanner provides 1000 line definition; use for closed circuits, video mapping, or overprinting of maps on radar displays, air traffic control, and television effects. (*EI*, 1952)

507. THE HISTORY OF TELEVISION
Garratt, G. R. M., Mumford, A. H.
Institution of Electrical Engineers, Paper 1320 (Television Convention 1952); *Proceedings of the Institution of Electrical Engineers*, London, Part IIIA, v. 99, no. 17, pp. 25–42, 1952

A broad historical view of the various methods whereby visual phenomena may be reproduced at a distance but without regard to the method of transmission or to the time occupied in transmission. The earlier part of the paper deals with a number of proposals which aimed at providing a reproduction on paper of the original image in a form in accordance more with the practice of photography. (*EEA*, 1952)

508. LONG-DISTANCE PROPAGATION IN RELATION TO TELEVISION IN THE UNITED KINGDOM
Saxton, J. A.
Proceedings of the Institution of Electrical Engineers, London, Part IIIA, v. 99, no. 18, pp. 294–299, 310–312, 1952
Institution of Electrical Engineers, Paper 1270 (Television Convention 1952)

A review is given to the effects of irregularities in the terrain and of non-standard refraction in the troposphere on radio field-strength characteristics in the vhf band. (*EAA*, 1952)

509. TELEVISION IN GERMANY UP TO THE YEAR 1945
Goebel, G.
Archives Post-u. Fernmeldewesen, v. 5, pp. 59–93, August 1953

510. BROADCASTING AND TELEVISION RECEIVERS—GENERAL
IRE Convention Record, Part 7, Broadcasting and Television 1954

Includes, "Feasibility and Technique of Storing Color Video Information on Black and White Film" by W. L. Hughes.

511. SECOND COLOR TELEVISION ISSUE
IRE, Proceedings of the, v. 42, no. 1, pp. 1–48, January 1954

512. LA TÉLÉVISION AU SERVICE DE L'INDUSTRIE ET DE LA TECHNIQUE
Hemardinquer, P.
Électricité, v. 38, no. 204, 207, pp. 111–114, April 1954; pp. 202–206, July–August 1954

Techniques and equipment for industrial television. April: applications and specific problems; improved Farnsworth dissector with cesium-silver oxide surface and electron multiplier; French development of secondary emitters. July–August: Vidicon, Utiliscope, Vericon and Vericolor cameras; methods of transmitting on narrow bandwidths. (*EI*, 1954)

513. LA TÉLÉVISION INDUSTRIELLE ET SES APPLICATIONS
Singer, R.
Électricien, v. 82, no. 1927, pp. 42–48, March 1954

Industrial television and its applications; use of cable television for scientific research and industrial controls; history of research of closed circuit visio-telephony and of American development of pickup tubes and industrial television equipment; Vericon, Utiliscope and Philips systems. (*EI*, 1954)

514. WHAT IS TV DOING IN INDUSTRY
Tooling & Production, v. 19, no. 12, pp. 44–45, 76, 82–83, March 1954

515. FLYING TELEVISION WILL BE SIMPLER
Business Week, p. 34, January 29, 1955

516. NEW RECONNAISSANCE SYSTEM ANNOUNCED
Aviation Week, v. 63, p. 17, December 26, 1955

517. BIBLIOGRAPHY OF COLOUR TELEVISION
Television Society, April 1954, February 1955

Compilation of 416 references most of which are listed under two main classifications: optical and electrical; references in both sections arranged in chronological order and numbered; author index and list of periodical titles; bulk of references date from about 1930–1954; supplement covers 1954–January 1955. (*EI*, 1955)

518. IMAGE GRADATION GRAININESS AND SHARPNESS IN TELEVISION AND MOTION PICTURE SYSTEMS
Schade, O. H.
Journal of the SMPTE, February 1951, March 1952, August 1953, and November 1955

519. RUSSIAN COLOUR TELEVISION
Wireless World, v. 61, no. 3, pp. 127–128, March 1955

Moscow experimental station using frame sequential system for color and employing rotating discs both at transmitter and receiver; vision frequency is 78 mc, voice frequency 87.75 mc and over-all channel width 12 mc; raster gives 525 line picture; transmitted waveform is shown. (*EI*, 1955)

520. THE INFLUENCE OF THE OPTICAL SYSTEM ON THE TELEVISION PICTURE
Below, F., Grabke, H.
Technische Hausmitteilungen des Nordwestdeutschen Rundfunks, v. 7, no. 9–10, pp. 171–173, 1955 (in German)

It has been shown when test-line films are televised the contrast obtained from the optical system changes considerably with the thickness of the lines, and also according to their position in the picture. The paper gives the results of actual measurements. As, however, it may be presumed that incorrect contrast can result from the gradation characteristics of the photographic emulsion, only purely optical measurements were made at first. Present results suggest that from the reproduction of a black-to-white step it is possible to make a sufficiently accurate assessment of the process of degradation. (*EEA*, 1956)

521. SATELLITE AND BOOSTER-STATION ALLOCATION DEVELOPMENTS
Reed, O. Jr.
Electrical Engineering, v. 74, no. 11, pp. 962–966, November 1955

A general engineering survey of the problem of auxilliary television transmitters is presented. "Boosters" operate on the same frequency, "Satellites" on a different channel from the parent transmitter. A brief account of the FCC procedure is given with regard to frequency allocation policy and permissible power, illustrated by some typical examples and schematic coverage maps. (*EAA*, 1956)

522. EARLY DAYS OF TELEVISION
Hogan, J. V. L.
Journal of the SMPTE, v. 63, pp. 169–173, November 1956

Describes the most significant early developments from May's transmitter in 1842 through the present.

523. EVOLUTION OF MODERN TELEVISION
Jensen, A. G.
Journal of the SMPTE, v. 63, pp. 174–188, November, 1956

Reviews television in its transition from mechanical systems to completely electronic methods. Discusses cathode-ray tube receivers, cathode-ray tubes, flying spot scanners, and camera tubes.

524. APPLICATIONS OF TELEVISION TO MILITARY OPERATIONS
Oppenheimer, H. C.
Journal of the SMPTE, v. 63, pp. 150–152, October 1956

525. TELEVISION, A MILITARY INTELLIGENCE AND COMMUNICATIONS MEDIUM
Gray, N., Jangarathis, J. C.
Electrical Engineering, v. 75, pp. 1069–1074, December 1956; also in *Journal of the SMPTE*, v. 65, pp. 415–418, August 1956

526. SATELLITE TELEVISION
Grund, J. B.
Radio & TV News, v. 55, pp. 50–52, May 1956

527. AUTOPILOT AND TELEVISION-EQUIPPED AERIAL DRONE
McCulloch, R.
Electrical Engineering, v. 75, pp. 768–769, August 1956

528. TELEVISION APPLICATIONS IN AVIATION
Grover, J. H. H.
British Communications and Electronics, v. 4, no. 2, pp. 82–85, February 1957

Some of the uses of closed-circuit television systems in the aircraft industry are described, including the observation of air flow over wings in a wind tunnel. Some possible applications in crowd control, reconnaissance, etc., using a link from ground to air or vice versa, are also discussed.

529. THE APPLICATION OF TRANSISTORS TO TELEVISION
Barry, J. N., Jackets, A. E.
Television Society Journal, v. 8, no. 8, pp. 318–334, October–December, 1957

Recent progress in the design of transistors is reviewed briefly, and it is shown that considerable advances have been made in the case of junction transistors both in respect to high-frequency operations and power handling capacity. Possible applications to the case of color TV are discussed briefly.

530. NEW DEVELOPMENTS IN INDUSTRIAL TELEVISION
Spiegel, E. F.
Elektronische Rundschau, v. 11, no. 9, pp. 261–263, September 1957 (in German)

A new miniature vidicon has been developed with a diameter of 13.5 mm and a length of 90 mm, is capable of 250 lines and 2 lux sensitivity for 0.02 μA signal current. An infrared-sensitive vidicon has also been developed. Several applications are discussed. (*EEA*, 1958)

531. LITTON BUYS CHROMATIC TELEVISION FACILITIES
Aviation Week, v. 66, p. 110, January 28, 1957

532. TELEVISION IN SCIENCE AND INDUSTRY
Zworykin, V. K., et al.
Radio Electronics, v. 29, p. 35, October 1958

533. FUTURE TELEVISION POSSIBILITIES
Gersback, H.
Radio-Electronics, v. 29, p. 31, February 1958

534. MILITARY USES OF TELEVISION
Journal of the SMPTE, v. 67, pp. 441–479, July 1958

535. AIRBORNE CLOSED-LOOP TELEVISION SYSTEM
Flacco, A. F.
Journal of the SMPTE, v. 67, pp. 477–479, July 1958

536. EARTH SATELLITE PHOTOGRAMMETRY
Rosenberg, P.
March 26, 1958
Photogrammetric Engineering, pp. 353–360, June 1958

537. APPLICATIONS OF INDUSTRIAL TELEVISION
Dujardin, I.
Bulletin société belge des électriciens, v. 74, no. 3, pp. 205–214, July–September 1958 (in French)

Applications include observation and control of: (1) dangerous and inaccessible operations, and (2) activities where simultaneous observation of several operations is required.

538. MINIATURE MOVIES OF THE PLANETS
Baker, S. C., Kelso, J. M.
Astronautics, v. 4, no. 5, pp. 26–28, May 1959

Systems have been designed at the Space Technology Labs. to obtain pictures with our first planetary probes. Briefly, these systems generate electrical signals, representing a desired picture, which are relayed to Earth by a radio transmitter. This system takes advantage of the vehicle spin to furnish line scanning. Problems and limitations are discussed.

539. AN INTERPOLATION METHOD FOR THE PHOTOGRAPHIC DETERMINATION OF THE POSITION OF A CELESTIAL OBJECT
Kiselev, A. A.
Soviet Astronomy, v. 3, no. 3, p. 349, March–April 1959 (in Russian)

540. BRITONS PROBE NEW TV USES
Electronics, v. 32, no. 31, pp. 39, 42, July 31, 1959

A brief discussion of new closed circuits, techniques, grating circuits, and scanning systems.

541. CIRCUITS FOR SPACE PROBES
Bennett, R. R., Gleghorn, G. J., et al.
Electronics, v. 32, pp. 55–57, June 19, 1959

This article discusses such things as magnetic field measurement and possible TV systems.

B. Reports

542. DEVELOPMENT, FLIGHT TESTING, AND EVALUATION OF TELEVISION RECONNAISSANCE SYSTEM AN/UXQ-1(V)
Etheridge, L. R.
July 1958
Aerial Reconnaissance Lab., WADC, Wright-Patterson AFB, WADC TR 58-374
AD 155,731

543. "START" TELEVISION SET
1957
Air Technical Intelligence Center, Wright-Patterson AFB, ATIC 3065 91; Translation F-TS-9441/III
AD 162,896

544. THE FLIGHT TESTING OF THE REMOTE SIGHT-SYSTEM
Lauer, T. B.
January 28, 1954
Armament Laboratory, Wright Air Development Center, Technical note WCLG 54-7
AD 28,410

The system, a wired television system with the camera mounted in a turret to enable it to look anywhere within a hemisphere, consists of a camera, an indicator, a hand control, and a power supply. A 7-in. cathode-ray tube is used as the picture tube, and a 3-in. cathode-ray tube is used as a C-scope to indicate the position of the line of sight of the camera. The equipment was tested on a C-45F aircraft. Values ranging from 1.14 to 5.6 mi were obtained for the average tracking range using T6, T28, C45, B26, and B17 targets.

545. INVESTIGATION OF TELEVISION TECHNIQUES AS A MISSILE-TRACKING AID
Eichelberger, W. H., Roberts, H. L.
Denver Research Institute
Contract N123s-1019A
AD 60,442

546. INVESTIGATION OF TELEVISION TECHNIQUES AS A MISSILE-TRACKING AID, PART II
Roberts, H. L.
Denver Research Institute
Final Report April 1, 1955–March 31, 1956
Contract N123s-1019a
AD 95,853

The problem of seeing aerial objects at long distances through the atmosphere was considered. A TV system was designed for obtaining maximum optical range with a tracking theodolite. The system uses a red-sensitive vidicon, 300 scanning lines, and a frame rate of 30 c without interlace. Both high- and low-pass filters are used in the video amplifier chain. A 45 deg mirror was incorporated in the viewing hood so that the elevation tracker could use the TV viewfinder. The Kay-lab viewfinder was modified to accept the video signal from the camera control unit. In this way, the TV picture presented to the tracker had the benefit of the video processing obtained at the control station. Sweep-circuit triggering was

obtained from the TV blanking pulses which provide suitable triggering for both the horizontal and vertical sweep rates. Performance was limited by the uneven character of the vidicon photoconductive layer. In clear sky the TV system could track only 80% of the distance that an aerial object could be seen with a 20-power tracking telescope. In light haze the system could track 10% further than the human eye. An IR converter tube could not track as far as the TV system under any conditions. (ASTIA)

547. DESIGN TECHNIQUES FOR SPACE TELEVISION
Viterbi, A. J.
April 13, 1959
Jet Propulsion Laboratory, California Institute of Technology, Pasadena
EP Number 623

The design requirements are outlined for the development of a space television system for a mission such as transmission of information from Venus to Earth.

548. NITE OWL, PROTOTYPE CLOSED-CIRCUIT TELEVISION; REPORT OF EVALUATION OF (U)
Woolen, W. S.
October 7, 1957
Naval Aviation Ordnance Test Station, Chincoteague, Va.
Letter Report 1 (Confidential)
AD 146,162

549. TELEVISION INERTIAL GUIDANCE FOR CRUISE MISSILES (U)
Gordon, G., Hutcheson, J. H., Smith, F. T.
November 27, 1957
RAND Corporation, Santa Monica, Calif.
Research Memo RM-2020, Contract AF 33(038)6413 (Secret)
AD 150,697

A study is made of two guidance systems applicable to cruise missiles. One is a short-range, high-accuracy system using an inertial navigator for midcourse guidance and a TV sensor (with data link) for terminal guidance. The other is a long-range (1200 nm) system using an inertial navigator for both midcourse guidance and terminal guidance. The inertial system is supplemented with a TV type sensor and meteor burst communication link to reduce the navigation error. Both systems appear feasible. However, they differ primarily in the propagation characteristics of their data links. (Unclassified Abstract) (ASTIA TAB U58)

550. A PHOTOGRAPHIC SYSTEM FOR CLOSE-UP LUNAR EXPLORATION
Davies, M. E.
May 23, 1958
RAND Corporation, Santa Monica, Calif., RM-2183 (ASTIA AD-156,021) (Projects; Space Technology)

The design of a camera to photograph either the visible or the hidden side of the Moon from an early space vehicle is discussed. A panoramic-type camera uses the vehicle spin for scanning, the motion of the film past a slit compensating in rate for the spin and eliminating blurring. (ASTIA)

551. GUIDED MISSILE INSTRUMENTATION TELEVISION APPLICATIONS
Shelton, C. T., Walker, B. F., et al.
RCA Defense Electronic Products, Camden, N. J.
Quarterly Progress Report 3, January 1–March 31, 1957
Contract DA 36-039-sc-72825
AD 148,244

552. TELEVISION NIGHT VISION DEVICE
Radio Corporation of America
Bimonthly Status Report 1, June 1–August 1, 1957
Contract DA 44-009-eng-3254
AD 143,828

C. Books

553. FIRST PRINCIPLES OF TELEVISION
Dinsdale, A.
John Wiley & Sons, New York, 1932

554. TELEVISION ENGINEERING
Fink, D. G.
McGraw-Hill Book Co., Inc., 2nd edition, New York, 1952

555. ELEMENTS OF MATHEMATICS FOR RADIO, TELEVISION, AND ELECTRONICS
Fischer, B. and J.
Macmillan Co., New York, 1954

556. TELEVISION. VOL. III (1938–1941)
Goldsmith, A. N., et al.
RCA Laboratories, Princeton, N. J., 1946

This is the third volume in a series of four from 1936–1946. These papers are presented in four sections: pickup; transmission; reception; and general. The appendix to this volume includes a summary of all the papers published in Volumes I and II.

557. TELEVISION. VOL. IV (1942–1946)
Goldsmith, A. N., et al.
RCA Laboratories, Princeton, N. J., 1946

The papers presented in this volume are in six sections: pickup; transmission; reception; color TV; military TV; and general. The appendix covers the material from 1929–1946.

558. TELEVISION
Hathaway, K. A.
American Technical Society, Chicago, 1933

Much space is given to scanning systems and devices; especially mechanical methods.

559. 4000 YEARS OF TELEVISION: THE STORY OF SEEING AT A DISTANCE
Hubbell, R. W.
G. P. Putnam's Sons, New York, 1942

560. ELECTRON OPTICS IN TELEVISION
Maloff, K. G., Epstein, D. W.
McGraw-Hill Book Co., Inc., New York, 1938

561. CLOSED CIRCUIT TV SYSTEM PLANNING
Mayers, M. A., Chipp, R. D.
John F. Rider Publisher, Inc., New York, 1957

562. CLOSED CIRCUIT AND INDUSTRIAL TELEVISION
Noll, E. M.
Macmillan Co., New York, 1946

563. BASIC TELEVISION
Schure, A.
Rider, 1958, 5 vols.
John F. Rider Publisher, Inc., New York, 1957

564. ESSENTIALS OF ELECTRICITY FOR RADIO AND TELEVISION
Slurzberg, M., Ostergeld, W.
McGraw-Hill Book Co., Inc., New York, 1956

565. TELEVISION TODAY AND TOMORROW
Slurzberg, M., et al.
Crown Publishers, Inc., New York, 1957

566. TELEVISION: THE ELECTRONICS OF IMAGE TRANSMISSION
Zworykin, V. K., Morton, G. A.
John Wiley and Sons, New York, 1954

567. TELEVISION IN SCIENCE AND INDUSTRY
Zworykin, V. K., et al.
John Wiley and Sons, New York, 1958

V. TELEVISION SCANNING SYSTEMS

A. Periodicals

568. COMPLEX TELEVISORS TO GIVE LARGE IMAGES
Green, H.
Radio News, v. 10, no. 6, pp. 536–637, December 1928

The imitating action of the eye eliminates the need for a scanning disc.

569. OPTICAL CONDITIONS FOR DIRECT SCANNING IN TELEVISION
Gray, F., Ives, H. E.
Journal of the Optical Society of America, v. 17, no. 6, pp. 428–434, December 1928

570. MECHANICAL DEVELOPMENTS OF FACSIMILE EQUIPMENT
Ranger, R. H.
IRE, Proceedings of the, v. 17, no. 9, pp. 1564–1575, 1928

571. REFLECTION SCANNING METHOD IN FACSIMILE TELEGRAPHY
Schroeter, F.
Zeitschrift für technische Physik, v. 10, no. 8, pp. 323–327, 1929

572. DIRECT SCANNING IN TELEVISION
Gray, F.
Bell Laboratories Record, v. 7, no. 7, pp. 276–278, March 1929

573. A PRACTICAL TELEVISION SYSTEM
Replogle, D. E.
Projection Engineer, v. 2, no. 5, pp. 7–11, May 1930

A description of the photoelectric cell and various scanning and amplifying systems.

574. PHOTOELECTRIC CELLS, SCANNING DISCS, TINY MOTORS AND TUBE CURRENT METERS, NEW TOOLS FOR RESEARCH
Manning, E. L.
Projection Engineer, v. 2, no. 11, pp. 20 and 24, November 1930

575. TELEVISION FILM AND PHOTOELECTRIC-CELL AMPLIFIER
Kirchstein, F.
Fernsehen, v. 1, no. 8, pp. 358–361, August 1930

576. ABOUT SCANNING DISCS
Cato, G. C.
Television, v. 3, no. 26, pp. 94–96, April 1930

577. AM WENDEPUNKTE DES FERNSEHENS
Winckel, F. W.
Zeitschrift für Fernmeldetechnik, v. 13, no. 7, pp. 105–108, July 20, 1932

The turning point in TV; new principles and devices; two-zone Nipkow scanning disc; scanning mirror, cathode-ray tube with Wehnelt control.

578. DESIGN OF LENS SCANNING SYSTEM FOR TELEVISION
Block, I.
Radio Engineering, v. 12, no. 6, June 1932

579. DIE LINSENSCHIEBE
Busse, E.
Fernsehen und Ton-Film, v. 3, no. 2, pp. 78–87, April 1932

The design and characteristics of the lens-scanning disc.

580. I RECENTE PROGRESSI DELLA RADIOTELEVISIONE
Banfi, A.
Alta Frequenza, v. 2, no. 5, pp. 629–644, December 1933

Fundamental principles are explained together with scanning devices now in use.

581. OPTICAL EFFICIENCIES AND DETAIL IN TELEVISION SYSTEMS
Marconi Review, v. 47 and 48, pp. 21–28, March–April 1934, pp. 9–19, May–June 1934

Relative efficiencies of several orthodox methods using mechanical methods of scanning and problem of obtaining data relating to detail required in final picture to frequency band necessary.

582. TELEVISION BY ELECTRON IMAGE SCANNING
Farnsworth, P. T.
Franklin Institute Journal, v. 218, pp. 411–444, October 1934

583. TELEVISION SCANNING SURVEY
Davies, R. F.
Electronics, v. 8, no. 11, pp. 30–32, November 1935

584. SCANNING SEQUENCE AND REPETITION RATE OF TELEVISION IMAGES
Kell, R. D., et al.
IRE, Proceedings of the, v. 24, no. 4, pp. 559–576, April 1936

585. METHODS OF TWO WAY SCANNING IN TELEVISION
Denisov, V.
Technical Physics of the USSR, v. 4, no. 5, pp. 383–403, 1937

586. SCANNING IN TELEVISION RECEIVERS
Somers, F. J.
Electronics, v. 10, no. 10, pp. 18–21, October 1937

587. MECHANISCHER UNIVERSAL ABTASTER FÜR PERSONEN-FILM UND DIAPOSITIVUBERTRAGUNGEN
Thom, K.
Fernseh Ag., v. 1, pp. 42–48, December 1938

588. THE NIPKOW DISC
Rinia, G., Leblans, L.
Philips Technical Review, v. 3, no. 4, pp. 42–47, February 1939

589. CONTINUOUS TYPE TELEVISION FILM SCANNER
Goldmark, P. C.
Journal of the SMPE, v. 33, pp. 18–25, July 1939

590. SIMULTANEOUS COLOR TELEVISION—THE FLYING SPOT "LINE" PICKUP
RCA Review, v. 5, pp. 224–228, 1940

591. FILM SCANNER FOR USE IN TELEVISION TRANSMISSION TEST
Jenson, A. G.
IRE, Proceedings of the, v. 29, no. 5, pp. 243–249, May 1941

592. SCANNING THEORY
Sabaroff, S.
SMPE, Journal of the, v. 36, May 1941

593. FILM SCANNER FOR USE IN TELEVISION TRANSMISSION TESTS
Jensen, A. G.
IRE, Proceedings of the, v. 29, pp. 243–249, May 1941

594. TELEVISION FILM TRANSMITTERS USING APERTURE SCANNING DISCS
Espley, D. C., Walter, D. O.
Journal of the Institution of Electrical Engineers, v. 88, pp. 145–171, June 1941

595. TELEVISION SCANNING PROCESS
Mertz, P.
IRE, Proceedings of the, v. 29, no. 10, pp. 529–537, October 1941

596. UNIQUE FILM SCANNER FOR TESTING TELEVISION TRANSMISSION IMAGES
Knoop, W. A.
International Projectionist, v. 16, no. 5, pp. 18–19, May 1941

597. METHOD AND EQUIPMENT FOR CHECKING TELEVISION SCANNING LINEARITY
Duke, V. J.
Television Society Journal, v. 3, no. 9, pp. 244–247, 1942

598. TELEVISION WITHOUT SCANNING
Craig, P. H.
Electronic Industries, v. 3, no. 1, pp. 122, 224–230, January 1944

599. SCANNING SYSTEMS FOR COLOUR TELEVISION
Jesty, L. C.
Electronic Engineering, v. 17, no. 206, pp. 456–460, April 1945

600. ELECTROMAGNETIC FRAME SCANNING
Cocking, W. T.
***Wireless World*, v. 52, no. 9, pp. 289–291, September 1946**

Design problems of time base amplifier are discussed in detail; characteristics of deflecting coil; use of low inductance deflector coils is desirable because they reduce interaction between line and frame deflection circuits, and they are easier to wind; consideration of transformer coupling. (*EI*, 1947)

601. NEW SCANNING METHOD FOR TELEVISION
Schroetter, F.
***FIAT Review of German Science*, No. 865, "Six Papers on Television" I. (H. M. Station. Off; U.S. Department of Commerce) pp. 4–11, 1947 (in German)**

Picture element interlacing instead of line interlacing is proposed. A chess-board pattern is scanned by the spot leaping from 1st to 3rd, then to 5th picture element, etc., in all odd lines, each line being scanned in each field. The leaping motion is obtained by generating an additional saw-tooth waveform from a high harmonic of the line time-base frequency and superimposing the two to form a staircase curve. With magnetic deflection an auxiliary scanning coil of low power is required, with electrostatic, a third pair of plates. The new method is of great interest to multi-channel operation with electron beam commutators. (*EEA*, 1947)

602. AVENUES OF IMPROVEMENT IN PRESENT-DAY TELEVISION
Fink, D. G.
***IRE*, Proceedings of the, v. 36, no. 7, pp. 895–905, July 1948**

Comparison of 525-line TV with 16-mm motion picture film; effect of scanning irregularities included.

603. COLOR TELEVISION FILM SCANNER
Erde, B.
***Journal of the SMPE*, v. 51, no. 4, pp. 351–372, October, 1948**

Transformation of moving color film into video signals is accomplished with most faithful rendition when pick-up tube is of continuous cathode or nonstorage type, but this has limitation; in scanner of CBS, pickup tube is Farnsworth daylight image dissector; optical electronic method, requiring no moving optical parts, is used to compensate for continuous motion to film. (*EI*, 1949)

604. CATHODE-RAY TUBE VIDEO SCANNER
Thompson, R. D.
***Communications*, v. 29, no. 9, pp. 24–25, 33, September 1949**

Features of television photographic transparency pick-up equipment; device, developed as test and program source, includes focus stabilizer, provision for 2×2 slides, automatic fade to black, gamma corrector, and polarity inverter; block diagrams. (*EI*, 1949)

605. SOME TECHNICAL ASPECTS OF TELEVISION
Bedford, L. H.
***Journal of the Royal Society of Arts*, v. 97, no. 4788, pp. 180–194, February 11, 1949**

Principle of television based on process of scanning proposed by Nipkow in 1883; frequency bandwidth required to transmit picture intelligence in scanned form; odd line method of producing interlaced raster; illustrated description of iconoscope, Zworykin tube, and image orthicon; optimum number of lines for assigned frequency band.

606. APPROACHES TO CBS COLOR
Battison, J. H.
***Tele-Tech*, v. 9, no. 12, pp. 44–45, December 1950**

Problems which must be solved in implementing field sequential color television developed by Columbia Broadcasting System; discussion of synchronizing and scanning methods; schematic diagrams of various scanning and control circuits applicable. (*EI*, 1951)

607. FLYING-SPOT SCANNERS
Monro, C. R.
***Television Engineering*, v. 1, pp. 16–18, September 1950**

Describes equipment developed by RCA for transmission of "still" items such as announcements, test patterns, etc., using a flying-spot cathode ray tube, a double optical system and two photo-cells, with arrangements for mixing and fading their outputs. A block diagram and photographs showing details of layout and construction are given but no circuits are included. (*EEA*, 1951)

608. RACK-MOUNTED FLYING-SPOT SCANNER
Kuehn, R. L., Seigle, R. K.
***Radio-Electronic Engineering*, v. 16, pp. 7A–9A, April 1951**

Equipment for transmitting television test patterns, etc., using a short persistence cathode ray tube and multiplier photocells. (*EEA*, 1951)

609. NEW SCANNING CIRCUIT
Court, P. R.
***Wireless World*, v. 56, no. 8, pp. 287–290, August 1950**

Description of operation of simple sawtooth-driven line scanning circuit employing efficiency diode; complete circuit given including refinements such as high voltage boost for output tube, fly-back voltage supply, and linearity control.

610. SCANNING CURRENT LINEARIZATION BY NEGATIVE FEEDBACK
Keen, A. W.
***Television Society Journal*, v. 6, pp. 308–315, October–December 1951**

An introductory qualitative survey of the known methods of applying negative feedback to the problem of linearizing the output current of scanning systems needed in television transmitting and receiving equipment. (*EEA*, 1952)

611. MATHEMATICAL ANALYSIS OF EQUIVALENT SCANNING CIRCUIT
McFarlane, A. B., Smith, J. R. W.
***Journal of the British Institution of Radio Engineers*, v. 11, no. 10, pp. 470–476, October 1951**

Classical treatment of switched LCR parallel circuit by differential equations; effects of Q changes; formulas for circuits; energy fluctuations in oscillatory and non-oscillatory states are examined and numerical and practical example is solved. (*EI*, 1951)

612. CONTINUOUS FILM SCANNER FOR TV
***Electronics*, v. 24, no. 7, pp. 114–116, July 1951**

Superiority of flying-spot method of television transparencies over methods using iconoscope camera and wider band; description of mirror drum projector designed as high fidelity television signal source by research staff of Bell Telephone Laboratories, which uses two electronic servo controls to compensate for jitter and flicker, and permits flying-spot scanning of 24 frame film at 60 fields. (*EI*, 1951)

613. DOT-INTERLACED TELEVISION
Gouriet, G. G.
***Electronic Engineering*, v. 24, no. 290, pp. 166–171, April 1952**

Description of system where horizontal scanning lines are further divided into vertical lines, each line being broken into dots representing picture elements; method obtains subjective increase in information transmitted for given bandwidth; theory of sampling is given and mode of transmission shown; limitations of interlacing; application to color television. (*EI*, 1952)

614. ELECTROMAGNETIC SCANNING GENERATORS FOR TELEVISION
Whitaker, L. W.
***Marconi Review*, v. 15, no. 104, pp. 1–24, 1st quarter 1952**

Various scanning generators are examined with particular reference to use of negative feedback; simple theory relating to scanning generators; classification of all scanning generators of electromagnetic type; description of some examples of feedback linearized circuits; particularly that form known as "Magnetic Miller" circuit. (*EI*, 1952)

615. CONTINUOUS MOTION PICTURE PROJECTOR FOR USE IN TV SCANNING
Jensen, A. G., Graham, R. E., Mattke, C. F.
***Journal of the SMPTE*, v. 58, pp. 1–21, January 1952**

616. THE DEVELOPMENT OF A HIGH QUALITY 35MM FILM SCANNER
Nutall, T. C.
***Proceedings of the Institution of Electrical Engineers*, London, v. 99, pp. 136–144, April–May, 1952**

617. A CONTINUOUS-MOTION SYSTEM FOR TELEVISING MOTION-PICTURE FILM
Holman, H. E., Lucas, W. P.
Institution of Electrical Engineers, Paper 1316 (Television Convention 1952)
Proceedings of the Institution of Electrical Engineers, London, Part IIIA, v. 99, no. 17, pp. 95–108, 174–178, 1952

Features of motion-picture film reproduction by the medium of television are considered, and an explanation is given of the continuous-motion flying-spot system. The methods adopted to overcome particular problems are analyzed, and the development of special facilities, both mechanical and electrical, are described. (*EEA*, 1952)

618. FLYWHEEL SCANNING AND SYNCHRONIZING CIRCUITS
Fairhurst, H.
Television Society Journal, v. 7, no. 4, pp. 152–159, October–December 1953

Merits of usual and more improved types of circuits associated with picture formation; circuits which dispense with reactance tube and sine-wave oscillator and employ instead d-c control of frequency of blocking oscillator which is driving output stage; circuit time constant and other design factors; use of "initial frequency sweep" coincidence detectors and other circuit expedients; schematic diagrams. (*EI*, 1954)

619. A PRECISION LINE SELECTOR FOR TELEVISION USE
Abrahams, C., Thor, R. C.
IRE Convention Record, 1953

620. FERNSEH-PUNKTLICHT-ABTASTUNG MIT KATHODENSTRAHLROEHREN
Theile, R.
Fernmeldetechnische Zeitschrift, v. 6, no. 11, pp. 523–527, November 1953

Television flying-spot scanner with cathode ray tubes; operating characteristics of flying-spot scanners; analysis of afterglow on cathode ray screen; application of negative feedback to control electrode of scanning tube. (*EI*, 1954)

621. FERNSEH-PUNKTLICHT-ABTASTUNG MIT KATHODENSTRAHLROEHREN. II.
Thiele, R.
Fernmeldetechnische Zeitschrift, v. 7, no. 7, pp. 339–345, July 1954

Television spotlight scanning with cathode ray tubes; operating characteristics of flying spot-scanning system in which signal distortions caused by luminescence of fluorescent screen may be compensated in amplifier or by feeding signal back to scanning tube. Bibliography. (*EI*, 1955)

622. CONTINUOUS FILM SCANNER FOR MONOCHROME AND COLOR
Traub, E. H., Fisher, J. F.
Electronics, v. 27, no. 8, pp. 152–157, August 1954

Optical features and electronic circuitry of rotating polygon flying-spot scanner, originally developed as high quality color signal source, now adapted for broadcast applications; device avoids problems of color synchronization registration and shading effects occasioned by disparity between 24 frames/sec sound films and 30 frames/sec television scanning systems. (*EI*, 1954)

623. MARCONI FLYING-SPOT TELECINE EQUIPMENT
Television Society Journal, v. 7, no. 6, p. 262, April–June 1954

624. FLYING SPOT SCANNER
van der Poel, F. H. J., Valeton, J. J. P.
Philips Technical Review, v. 15, no. 8–9, pp. 221–232, February–March 1954

625. NEW 35MM TELEVISION FILM SCANNER
Traub, E. H.
Journal of the SMPTE, v. 62, pp. 45–54, January 1954

626. CONTINUOUS ALL ELECTRONIC SCANNER FOR 16MM COLOR MOTION-PICTURE FILM. PART I.
Grazieno, V., Schlesinger, K.
Journal of the SMPTE, v. 62, pp. 294–305, April 1954

627. COLOR CHARACTERISTICS OF A TELEVISION FILM SCANNER
Haines, H. H.
IRE Convention Record, Part 7, Broadcasting & Television, pp. 100–104, 1954

628. FLYING-SPOT SCANNER AND TRANSMISSION OF EPISCOPIC IMAGES
Stier, H., Lindner, P., Kosche, E.
Nachrichtentechnische Zeitschrift, v. 5, no. 12, pp. 537–541, December 1955 (in German)

A brief account of the operation of a flying-spot scanner is presented, with particular emphasis on the choice of the ZnO phosphor for the screen and its short-persistence properties. A mathematical analysis of the relationship between the obtainable photocurrent and various optical and raster parameters is given. The complete scanner is then described with the aid of diagrams. The desired capacity is placed at the back of an Ulbrich sphere and is scanned with the help of a swinging mirror, a separate photocell pickup with amplifier providing an afterglow compensation. Other refinements include automatically regulated rf e.h.t. generation, gamma correction, gated blacklevel control and a built-in cathode ray tube monitor. A bibliography is provided. (*EEA*, 1956)

629. NEW DESIGN IN CLOSED-CIRCUIT TELEVISION
Martin, A. V.
Tele-Tech and Electronic Industries, v. 14, no. 4, pp. 94–96, 112, 133, April 1955

Particulars of spiral scanning method which offers significant advantages over conventional TV transmission, notably lower power requirements and more efficient use of lenses. It is shown that rectangular picture while esthetic for TV, actually leads to bad utilization of lenses, pick-up tubes, and receiving kinescopes; design features of round picture TV screen. (*EI*, 1955)

630. SPIRAL SCANNING
Wireless World, v. 61, no. 1, p. 2, January 1955

Simple scanning method for industrial equipment; waveform in 15-kc sine wave modulated with 50-cps sawtooth to produce spiral scan; first signal is applied to horizontal deflector coils of camera tube and receiving cathode ray tube and second signal displaced 90 deg in phase, to vertical deflector coils; highest definition is in center of pattern. (*EI*, 1955)

631. FILM CHARACTERISTICS OF TELEVISION SCANNING
Nuttal, T. C., Partington, G. E.
British Kinematography, v. 27, no. 3, pp. 72–87, September 1955

Expansion of television in Great Britain and greater use of film; how improvements can be effected by attention to certain details in use of modern flying-spot scanning equipment; possibilities of camera tube scanners such as vidicon film scanners, etc; film characteristics required by camera tube scanners; effect of transmitting and receiving equipment characteristics. (*EI*, 1955)

632. FLYING-SPOT SCANNER FOR COLOR TELEVISION
Putman, R. E.
Journal of the SMPTE, v. 64, no. 6, pp. 324–325, June 1955

Equipment for use with continuous motion projector for television broadcasting applications; problems encountered from origination of spot of light till NTSC color output signal is obtained; block diagram of flying-spot scanner channel. (*EI*, 1955)

633. DIFFERENTIAL WIDTH CONTROL FOR TELEVISION LINE SCANNING CIRCUITS
Beauchamp, K. G.
Electronic Engineering, v. 26, no. 321, pp. 476–481, November 1954

634. CRITICAL CONSIDERATIONS ON OPTICAL COMPENSATION WITH ROTATING POLYGONAL PRISMS IN TELEVISION FILM SCANNING
Grabke, H.
Technische Hausmitteilungen des Nordwestdeutschen Rundfunks, v. 7, no. 9–10, pp. 166–170, 1955 (in German)

Contains directives for the design of film scanners with rotating polygonal prisms. From these are derived the requirements for polygonal prisms capable of providing pictures which satisfy certain specifications regarding geometry, resolution and brightness. Investigations show that a solution of the problem, even only moderately satisfactory, cannot be obtained with simple polygons.

A compromise may be obtained by using polygonal assemblies with at least 24 surfaces and a built-in glass corrector, with the film placed on the polygon, that is, with rigid coupling between film and polygon. The remaining shortcomings may be further reduced with nonrigid coupling. (*EEA*, 1956)

635. FILM SCANNER WITH A VIDICON

Mayer, N.

***Elektronische Rundschau*, v. 9, no. 8, pp. 283–287, August 1955 (in German)**

A survey of film scanning methods is presented. Three scanning methods are considered (flying-spot scanner, image dissector, storage pick-up tubes) and 4 methods of film transport (intermittent, continuous, continuous with optical compensation, continuous with vertical scan). It is shown that the vidicon camera is particularly suitable for the intermittent operation. The operation and characteristics of the vidicon are described and a quantitative analysis of possible horizontal resolution improvement by equalizers and the expected signal-to-noise performance is given. Of particular interest are charge-time vs scan-time diagrams for synchronous and non-synchronous operation. A brief description of the complete equipment is included. (*EEA*, 1956)

636. THE EFFECT OF THE OPTICAL SYSTEM ON THE MODULATION DEPTH IN TELEVISION SCANNERS

Dillenburger, W.

***Frequenz*, v. 9, no. 9, pp. 293–296, September 1955 (in German)**

A general investigation of the limit aperture of the lens systems which does not impair the resolution of a scanning system for the 5 mc/s bandwidth of the CCIR standard. Resolution of a square-wave signal of higher repetition rate possible by three different scanning apertures and the resulting modulation depth and contour deterioration are discussed briefly. The experimental procedure of checking maximum lens apertures is next described, and modulation depth at 5 mc/s vf is plotted for several optical systems. The special television xenon 1:2 lens will reproduce 90% modulation when opened up to the limit 1:2, the majority of well known lenses, however, must be stopped between 1:45 and 1:11. (*EEA*, 1956)

637. FLYING-SPOT SCANNER AND VIDICON. A COMPARISON BASED ON THE GERBER STANDARD

Dillenburger, W.

***Elektronische Rundschau*, v. 10, no. 7, pp. 181–184, July 1956, pp. 216–218, August 1956 (in German)**

Part I. The following critical comparison is made: (1) Image sharpness (optical and electron-optical: Both are satisfactory in the horizontal direction, but vidicon is slightly inferior in the vertical. (2) Resolution: While vidicon can resolve up to 7 mc/sec flying-spot scanner can reach 10 mc/sec which cannot be resolved by domestic receivers anyhow. (3) Gradation: Vidicon requires special gamma correction. There is no difference between individual pick-up tubes. (4) Signal-to-noise ratio: Similar and satisfactory. Vidicon is superior with films of high density. Other characteristics compared are image background, structure, spurious signals, mechanical stability, image geometry, microphony, etc., from operational not physical point of view.

Part II. Flying-spot scanners require elaborate film anti-shrinkage adjustment which can be an automatic compensating device and also suffer from flicker. Vidicon is much more critical in the adjustment of beam intensity. Automatic methods of correcting dc level operation are next discussed. Also briefly discussed are gamma correction and afterglow compensation in the flying-spot scanners. A summary indicates the main advantage of the vidicon tube is its ability to deal with films of varying density by simple yet versatile light and gamma adjustments.

638. HIGH RESOLUTION FLYING-SPOT SCANNER FOR GRAPHIC ARTS COLOR APPLICATIONS

Shapiro, L., Haynes, H. E.

***RCA Review*, v. 17, no. 3, pp. 313–329, September 1956**

A high resolution, slow speed reproducing system was developed to serve as input devices for an electronic computer which provides color correction in the production of half-tone plates for color printing. Discusses kinescope optical systems, scanning mechanisms, and deflection methods.

639. VITASCAN LIVE FLYING SPOT COLOR SCANNER
Haines, J. H., Tingley, G. R.
IRE, Transactions on Broadcast Transmission Systems, PGBTS-6, pp. 11–25, October 1956

Design features of DuMont "Vitascan" color TV system which produces live color television pictures of high quality without use of expensive and complicated color cameras; it represents all electronic version of earliest forms of mechanical live TV pickup; Vitascan cannot displace storage type color TV cameras but it has application for industry, research and as aid in broadcasting.

640. SLOW-SWEEP TV FOR CLOSED-CIRCUIT USE
Ennes, H. E.
Electronics, v. 29, no. 11, pp. 140–143, November 1956

Details of new TV system which uses 60-cps horizontal and 2–7-cps vertical repetition rates, in conjunction with long persistence phosphor display tube, to produce narrow bandwidth video signal of good resolution that can be transmitted over telephone or other audio communication circuits; circuit diagram. (*EI*, 1957)

641. VITASCAN, NEW COLOR TELEVISION SCANNER
Spicer, C. E.
Tele-Tech and Electronic Industries, v. 15, pp. 60–61, February 1956

642. SLOW-SCAN TELEVISION SYSTEM FOR CLOSED-CIRCUIT APPLICATIONS
Fathauer, G. H., Smith, R. H.
Electrical Engineering, v. 75, pp. 890–893, October 1956

643. LIVE FLYING-SPOT SCANNER: VITASCAN
Haines, J. H., Tingley, G. R.
Electrical Engineering, v. 75, pp. 528–533, June 1956

A review of the history, basic principles, studio requirements, and equipment.

644. A B C's OF COLOR TELEVISION
Barstow, J. M.
IRE, Proceedings of the, v. 43, no. 11, pp. 1574–1579, November 1955

Principles of color TV given in relatively simple terms. (*EI*, 1956)

645. VIDEO SCANNER MATCHES PHOTO PATTERNS
Oelbermann, E. J.
Electronics, v. 30, pp. 154–155, August 1957

646. WOBBLED SCANNING WITH A NEW CIRCUIT
Radio & TV News, v. 58, pp. 52–53, August 1957

647. COLOR TV SYSTEM USES FLYING-SPOT SCAN
Mate, H.
Electronics, v. 30, no. 2, pp. 138–142, February 1, 1957

System in which flying-spot scanner in camera head illuminates scene in darkened room; reflected light is picked up by red, green and blue sensitive phototube banks to form luminance and chroma signals; strobe lights provide general studio illumination during blanking periods; system is applicable to live pickup for commercial broadcasting and for industrial applications; schematic diagrams. (*EI*, 1957)

648. SLOW-SCAN ADAPTER FOR CONVENTIONAL TV SIGNALS
Altes, S. K., Reed, H. E.
Electronics, v. 30, no. 6, pp. 153–155, June 1, 1957

Reference to case where monitors used with industrial camera are located in same building and several other external viewing places are required; method whereby video signal from standard TV pickup source, such as camera or flying-spot scanner, is sampled to obtain slow-scan signal with bandwidth compression of 800 to one; narrow bandwidth signal can be used to transmit picture information via telephone simultaneously. (*EI*, 1957)

649. A FLYING-SPOT FILM SCANNER FOR COLOUR TELEVISION
Holman, H. E., Newton, G. C., Quinn, S. F.
IRE, Proceedings of the, Paper 2390R, v. 105B, pp. 317–330, July 1957

650. THE E.M.I. FLYING-SPOT FILM SCANNER FOR COLOUR TELEVISION
Holman, H. E., Newton, G. C., Quinn, S. F.
Acta Electronica, v. 2, no. 1–2, pp. 206–213, 1957–1958

Of the many methods of generating color television signals, that which introduces the least problems of registration and color matching is the flying-spot method of scanning. This article describes an example which offers a choice of scanning cycles adaptable to TV frequencies of 405/50, 625/50, and 525/60, and which employs electronic means to immobilize the continuous motion of a film.

651. PICKUP TUBE PERFORMANCE WITH SLOW SCANNING RATES
Shelton, C. T., Stewart, H. W.
Journal of the SMPTE, v. 67, no. 7, pp. 441–451, July 1958

Theoretical and experimental study of performance of image orthicons and vidicons at scanning rates varying from 1/20 to 10 frames/sec. At these slow rates, not only sensitivity but—in the vidicon—resolution is improved. A lower limit on scanning rate consistent with good image quality is discussed. (*EEA*, 1958)

652. SINGLE-LINE-SCAN TELEVISION
Harris, F. H., Ainsworth, J.
Review of Scientific Instruments, v. 30, no. 2, pp. 76–78, February 1959

Description of equipment constructed to show the practicability of using a vidicon camera tube for measuring the space orientation of spin-stabilized rockets.

653. A FLYING-SPOT FILM SCANNER FOR COLOR TELEVISION
Journal of the SMPTE, v. 68, p. 137, March 1959

Film moving with uniform velocity is scanned by a series of displaced rasters in such sequence that the system is applicable to 50- or 60-cycles/sec conditions. Three photomultipliers provide color analysis of the image, element by element, and directly produce a video-frequency signal. A particular equipment is described. The choice of red, green blue (RGB) coordinates is examined, and arrangements are discussed to minimize the color flicker, to provide uniform field illumination, and to offer the most accurate picture reproduction.

B. Reports

654. PROJECT MICHIGAN. OPTICS AND VISION
Blackwell, H. R.
June 1957
Michigan, University of, Willow Run Labs.
Progress Report for July 1, 1955–January 31, 1956
Report 2144-85-P, DA 36-039-sc-52654
AD 138,887

Progress is reported on the research program in the optics and vision group of the University of Michigan. Among the topics discussed is a scanning photoelectric microphotometer which can evaluate the transmittance of negative records from point to point. An automatic mechanical scanning feature makes it convenient and accurate for use in assessing the luminance distribution of the targets and backgrounds photographed.

655. THE DEVELOPMENT OF AN AUTOMATIC SCANNING DEVICE
Quarterly Progress Report 1, July 1–October 1, 1952
Pickard and Burns, Inc.
P and B Publication 163, Contract DA 44-009-1330
AD 219

Initial efforts were devoted to reviewing literature on information theory and correlation techniques and to consideration of various methods of scanning, correlating, and recording topographic information. The preliminary model of the proposed scanning and recording equipment will consist of 2 vidicon cameras, a correlator, and a facsimile recorder. The 2 images from a Multiplex projector will be formed on 2 separate areas of a ground-glass plate and scanned electronically in the X direction, while the cameras and facsimile scriber move at constant spacing in the Y direction. The electrical signals from the vidicon cameras are to be correlated in a phase detector, and the scriber will mark the facsimile paper when the output of the correlator exceeds a threshold value; an indication is thus obtained that the scanning elevation corresponds with the elevation of the terrain. Diagrams

are included of the proposed electronic equipment and a phase detector which approaches an ideal cross-correlator in its operation. (ASTIA)

656. TECHNICAL PROGRAM REVIEW 1958: (CF. 2: EXPLORATORY AND FOUNDATIONAL RESEARCH)

US Naval Ordnance Test Station, China Lake, January 1, 1959

Mention is made of a proposal for taking television pictures of the Earth from a small scanner weighing from 2 to 10 lb, moving in a polar orbit. Description of the television scanner is included.

VI. TELEVISION BANDWIDTH CONTROL

A. Periodicals

657. PARTIAL SUPPRESSION OF ONE SIDEBAND IN TELEVISION RECEPTION
Poch, W. J., Epstein, D. W.
IRE, Proceedings of the, v. 25, no. 1, Part 1, pp. 15–31, January 1937

658. TRANSMISSION SYSTEM FOR NARROW BANDWIDTH FOR ANIMATED LINE IMAGES
Skellett, A. M.
The Journal of SMPE, v. 33, pp. 670–676, December 1939

659. TELEVISION DEFINITION AND BANDWIDTH
Kirke, H. L.
Television Society Journal, v. 5, no. 8, pp. 233–234, December 1948

Erroneous assumption that number of lines is sole criterion of definition and that increase in number of lines automatically implies corresponding improvement in definition of received picture; data given showing relation between number of lines and requisite bandwidth for equal horizontal and vertical definition; horizontal definition expressed as equivalent number of lines obtainable with given bandwidth and number of lines. (*EI*, 1949)

660. THE EFFECT OF THE TRANSMITTED FREQUENCY BAND ON THE QUALITY OF THE TELEVISION PICTURE. I–II.
Schunack, J.
Arkiv der Elektrischen Übertragung, v. 3, pp. 301–304, November 1949, pp. 323–327, December 1949 (in German)

The maximum transmitted frequency required for a given number of picture elements per sec is considered. Owing to unequal resolution and scanning, a reduction of bandwidth was considered possible. It is shown that with further increase of the number of lines and improved picture quality this band is no longer satisfactory, particularly if dealing with sudden rapid light changes. (*EEA*, 1950)

661. EVALUATING VIDEO BANDWIDTH AND PICTURE QUALITY
Honnell, M. A., Prince, M. D.
Tele-Vision Engineering, v. 1, no. 9, pp. 10–11, 19–20, September 1950

Study of quality and lifelike appearance of TV picture as affected by video bandwidth of complete TV system; description of modified shunt compensated video interstage analysis method which permits control of bandwidth so that test material can be observed and transmission quality evaluated; system reveals extent that bandwidth in receiver can be decreased. (*EI*, 1950)

662. SAVING TELEVISION BANDWIDTH
Wireless World, v. 59, no. 4, pp. 158–162, April 1953

Review of various methods of reducing necessary bandwidth to transmit television picture; various aspects of visual acuity. (*EI*, 1953)

663. ECONOMY OF BANDWIDTH IN TELEVISION
Bell, D. A.
Journal of the British Institution of Radio Engineers, v. 13, no. 9, pp. 447–470, September 1953

From standpoint of theory of communication of "information," analysis is made of nature of television signals and devices for improving ratio of picture quality to bandwidth or for transmitting additional information through existing bandwidth; characteristics of spectrum of signals generated by conventional method of scanning picture; two proposals for reducing shared channel interference. (*EI*, 1953)

664. FERNSEHEN UND MODERNE INFORMATIONSTHEORIE
Schroedter, F.
***Arkiv der Elektrischen Übertragung*, v. 9, no. 1, pp. 1–7, January 1955**

Television and modern theory of information; instances, for which saving of bandwidth is vital, are shown and methods investigated for practical realization; decisive importance of image storage at transmitting and receiving end is shown allowing high degree of elimination of redundancy in video signal and other advantages of optical physiological nature decisive for application of certain varieties of velocity modulation. (*EI*, 1955)

665. DEMONSTRATION OF BANDWIDTH CAPABILITIES OF BEYOND-HORIZON TROPOSPHERIC RADIO PROPAGATION
Tidd, W. H.
***IRE, Proceedings of the*, v. 43, pp. 1297–1299, October 1955**

666. MODULATION PROBLEMS IN NARROW BAND COLOUR TELEVISION
Neidhardt, P.
***Elektronische Rundschau*, v. 10, no. 3, pp. 63–68, March 1956 (in German)**

A brief but competent survey of modern color television development. After an introduction to physics of color the NTSC system is explained with particular emphasis on the narrow band chrominance transmission, i.e., I-information reduced to the narrow Q-bandwidth. A brief explanation of a two-subcarrier system which does away with synchronous demodulation and subcarrier reinsertion of the NTSC system is then presented. A general description of sequential transmission systems follows, with an analysis of commutation methods by either square waves or sinusoidal waves phased in 120 deg steps. (*EEA*, 1956)

667. BANDWIDTH REDUCTION IN RELATION TO TELEVISION
Gouriet, G. G.
***British Communications and Electronics*, v. 3, no. 8, pp. 424–429, August 1956**

A brief account of the theoretical application of information theory to bandwidth considerations is given, consisting essentially in replacing the uniform scanning velocity by a uniform transmission of information, i.e., the average rate of sending information would be reduced. (*EEA*, 1957)

668. POSSIBILITIES OF REDUCED TELEVISION BANDWIDTH
Deutsch, S.
***IRE, Transactions on Broadcast and Television Receivers*, v. BTR-2, no. 3, pp. 69–82, October 1956 1956**

Following problem considered: given wide bandwidth of order to 50 kc, to devise standards such that entertainment value shall be maximized; four applications are: tape recording at tape speed of 15-in. per sec, telephone conversation accompanied over high quality telephone lines, long distance wire line transmission over high quality telephone lines, and short wave transmission over 120-kc channel. (*EI*, 1956)

669. BANDWIDTH COMPRESSION OF TELEVISION SIGNAL
Gouriet, G. G.
***Proceedings of the Institution of Electrical Engineers*, London, v. 104, Part B, no. 15, pp. 265–272, May 1957**

Discussion of means for reducing bandwidth by redistributing data in time so as to achieve constant rate of transmission; maximum compression is achieved by treating changes of brightness and changes in position as independent quantities, and using two channels for their transmission; method permits exchange to be made between picture size and continuity of grey scale. (*EI*, 1957)

670. SOME RELATION BETWEEN TELEVISION PICTURE REDUNDANCY AND BANDWIDTH REQUIREMENTS
Powers, K. H., Staras, H.
Transactions of the American Institute of Electrical Engineers, v. 76, Part 1, no. 32, pp. 492–496, September 1957

It is shown that bandwidth reduction of about two-to-one can be obtained by statistical coding, which, however requires complex equipment; best way of achieving bandwidth reduction is by cleverly degrading information in picture in such way that human observer would not notice it appreciably. (*EI*, 1957)

671. SYSTEM REDUCED TELEVISION BANDWIDTH
Electronics, v. 31, p. 8, August 15, 1958

672. BANDWIDTH REDUCTION SYSTEMS AND THEIR APPLICATION TO COLOUR TELEVISION
Delbord, Y. L.
Acta Electronica, v. 2, no. 1–2, pp. 364–370, 1957–1958 (in French)

The various bandwidth reduction systems used up to now in TV are discussed. Their respective merits and demerits are examined; some experimental results are discussed.

673. TRANSMISSION OF COORDINATES OF TELEVISION PICTURE ELEMENTS
Tsukkerman, I. I.
Radiotekhnika, v. 13, no. 4, pp. 77–79, 1958 (in Russian)

A mathematical analysis of bandwidth saving methods of television transmission is given, based on a new proposal of direct transmission of coordinates of picture elements which indicate a brightness change by at least one minimum perceptible brightness increment, and synchronous signals, ignoring completely conventional scanning. (*EEA*, 1958)

VII. TELEVISION CAMERAS

A. Periodicals

674. TELEVISION BY CATHODE RAY, THE NEW FARNSWORTH SYSTEM
Dinsdale, A.
Wireless World, v. 28, pp. 286–288, March 1931

675. THE IMAGE ICONOSCOPE
Iams, H., Morton, G. A., Zworykin, V. K.
IRE, Proceedings of the, v. 27, pp. 541–547, September 1939

676. THE ORTHICON, A TELEVISION PICKUP TUBE
Rose, A., Iams, H.
RCA Review, v. 4, pp. 186–199, October 1939

677. SOME FACTORS AFFECTING CHOICE OF LENSES FOR TELEVISION CAMERAS
De Vore, H. B., Iams, H.
IRE, Proceedings of the, v. 28, no. 8, pp. 369–374, August 1940

678. THE DAVISSON CATHODE RAY TELEVISION TUBE USING DEFLECTION MODULATION
Jensen, A. G.
Bell System Technical Journal, v. 30, pp. 855–866, October 1941

679. THE ICONOSCOPE—A MODERN VERSION OF THE ELECTRIC EYE
Zworykin, V. K.
IRE, Proceedings of the, v. 129, pp. 243–249, May 1941

680. THE IMAGE ORTHICON—A SENSITIVE TELEVISION PICKUP TUBE
Rose, A., Weimer, P., Law, H.
IRE, Proceedings of the, v. 34, pp. 424–432, July 1946

681. MINIATURE AIRBORNE TELEVISION EQUIPMENT
Kell, R. D., Sziklai, G. C.
***RCA Review*, v. 7, pp. 338–357, September 1946**

A developmental television camera, designed especially for airborne applications and using the image orthicon, is described. This camera is part of a complete airborne television transmitter system weighing 50 lb. The transmitter has a power output of 8 w in the 260–380-mc/s range. Experimental results in guiding a medium-angle bomb with aid of miniature equipment are given.

682. NEW TELEVISION CAMERA
***Electronic Engineering*, v. 20, no. 240, p. 59, February 1948**

Brief features of CPS (Cathode Potential Stabilization) Emitron which is electronic television pickup tube developed since end of war in EMI Research Laboratories Ltd. in England; advantages over previously used Emitron and Super-Emitron. (*EI*, 1948)

683. SIGNAL NOISE AND OPTICAL RELATIONS IN TELEVISION CAMERAS
Liebmann, G.
***Electronic Engineering*, v. 21, no. 254, pp. 121–124, April 1949**

Considerations of signal noise associated with pickup tube in television camera; pickup tube sensitivity and choice of lens system; optical relations in outdoor television broadcasts; telescopic arrangements for television camera. (*EI*, 1949)

684. ZOOM LENSES
Hopkins, H. H.
***Wireless World*, v. 55, no. 7, p. 250, July 1949**

Simplified version of zoom lens for television cameras where image remains in focus on photocathode when focal length of optical system is varied, creating illusion that camera is moving toward or away from scene; brightness of image remains constant since relative aperture is unchanged; image varied over range of 4:1. (*EI*, 1949)

685. CAMERA SHUTTERS
British Standards
***British Standards Institution*, no. 1592, 21 pp., 1949**

Standard applies to shutters for still cameras; interlens, behind-the-lens, and focal plane shutters; synchroflash mechanisms built into shutters; cable release sockets; terms used are defined; performance required; method of testing shutters and synchroflash equipment. (*EI*, 1950)

686. THE VIDICON PHOTOCONDUCTIVE CAMERA TUBE
Weimer, P. K., Forgue, S. V., Goodrich, R. R.
***Electronics*, v. 23, pp. 70–73, May 1950**

687. NEW TELEVISION CAMERA TUBES AND SOME APPLICATIONS OUTSIDE THE BROADCASTING FIELD
Zworykin, V. K.
***Journal of the SMPTE*, v. 55, pp. 227–242, September 1950**

The operation and performance characteristics of television camera tubes from the iconoscope to the image orthicon and vidicon are described briefly, stressing recent developments. The application of the vidicon in industrial television equipment and, in greater detail, possible uses of television techniques in astronomy are outlined. (*EEA*, 1951)

688. DESIGN OF TELEVISION CAMERA CHANNEL FOR USE WITH C.P.S. EMITRON
White, E. L. C., Harker, M. G.
***Proceedings of the Institution of Electrical Engineers*, Part 3, v. 97, no. 50, pp. 393–413, November 1950**

Portable television camera and associated equipment for BBC use is described; methods of testing over-all performance; characteristics of sensitivity, resolution, hum pickup and geometrical distortions. (*EI*, 1950)

689. OPNAME EN WEERGAVE BIJ TELEVISIE
Halbertsma, N. A.
***Electro-Technick*, v. 29, no. 18, pp. 337–340, August 30, 1951**

Pickup and transmission by television; design and operation of three and four lens cameras described and illustrated. (*EI*, 1951)

690. IMAGE TUBES AND TECHNIQUES IN TELEVISION FILM CAMERA CHAINS
Garman, R. L., Lee, R. W.
Journal of the SMPTE, v. 56, no. 1, pp. 52–64, January 1951

Although iconoscope is used almost universally for motion picture film camera chains, flying-spot scanner has come into extensive use in Europe: other pickup devices, storage and nonstorage, such as image orthicon, image iconoscope and image dissector tube, have been used experimentally or in limited commercial way; characteristics of tubes and their associated equipment are discussed. (*EI*, 1951)

691. NEW VIDEO RECORDING CAMERA
Gillette, F. N., White, R. A.
Journal of the SMPTE, v. 56, no. 6, pp. 672–679, June 1951

Specially designed camera which differs from usual 16-mm design; to accomplish intermittent film pulldown within short space of time available, multiple skip claw movement is utilized; usual mechanical shutter is eliminated, but device incorporated to actuate electronic shutter, provides for transition from 30-frames/sec television to 24-frames/sec film speed; other features. (*EI*, 1951)

692. PERFORMANCE OF THE VIDICON, A SMALL DEVELOPMENTAL TELEVISION CAMERA TUBE
Vine, B. H., Janes, R. B., Veith, F. S.
RCA Review, v. 13, pp. 3–10, March 1952

The performance of vidicons under development utilizing three different types of photoconductive layers is described. Data are given on gamma sensitivity, illumination considerations, spectral response, persistence and life. Vidicon construction and operation as well as s/n limitations are discussed. (*EEA*, 1952)

693. WALKIE-PUSHIE-LOOKIE TELEVISION CAMERA
Burrell, J. E.
Tele-Tech, v. 11, no. 9, pp. 64–66, 161, September 1952

How NBC group developed portable camera using standard RCA components in conjunction with battery and motor generator power supply; design features incorporated for flexible and unencumbered operation in covering sporting events, conventions, disasters, etc; picture is sent to receiving location by microwave transmitter; use of nondirectional antenna; operating methods. (*EI*, 1952)

694. DEVELOPMENTAL PORTABLE TELEVISION PICKUP STATION
Flory, L. E., et al.
RCA Review, v. 13, no. 1, pp. 58–70, March 1952

How completely portable battery operated television pickup unit has been designed, based on vidicon photoconductive pickup tube; "Walkie-Lookie" unit consists of 50 lb back-pack and 8 lb camera; equipment includes synchronizing generator and both video and sound channels operating on common u-h-f carrier to link unit with base station over distances up to ½ mile. (*EI*, 1952)

695. PACK-CARRIED TELEVISION STATION
Flory, L. E., et al.
Electronics, v. 25, no. 6, pp. 98–101, June 1952

Details of compact battery operated u-h-f television transmitter and control signal receiver which can be carried by one man along with camera and microphone, giving complete freedom from cables for program pickups within ¼ mile of control stations. (*EI*, 1952)

696. LONG-FOCUS LENS FOR TELEVISION CAMERAS
Engineer, v. 196, no. 5085, p. 60, July 10, 1953

Lens designed by Marconi's Wireless Telegraph Co., has focal length of 80 in. and was used during televising of Ascot race meeting June 18 to 19; its magnification is twice that of existing 40-in. lens. (*EI*, 1953)

697. APERTURE COMPENSATION FOR TELEVISION CAMERAS
Dennison, R. C.
RCA Review, v. 14, no. 4, pp. 569–585, December 1953

Aperture distortion in television pickup equipment is caused by finite size of scanning aperture; effect on image is reduction of resolution and detail contrast; compensation of aperture distortion can be effected with dispersionless wave filter of transversal type; simple equations for designing both fixed and variable boost aperture compensators are developed; procedure for achieving optimum compensation. (*EI*, 1954)

698. MONOCHROME VIDICON FILM CAMERA
Hurford, W. L., Marian, R. J.
***RCA Reciew*, v. 15, no. 3, pp. 378–388, September 1954**

Improvement of vidicon tube renders it useful for regular broadcast television; performance of television camera as affected by tube and its circuit; design of film camera chain; development of film pickup equipment representing new high in quality of film reproduction for television broadcasters. (*EI*, 1954)

699. FLAT PLATE TELEVISION TUBE
***Aero Digest*, v. 70, p. 56, February 1955**

700. TELEVISION VERTICAL APERTURE COMPENSATION
Schroeder, A. C., Gibson, W. G.
***Journal of the SMPTE*, v. 64, pp. 660–670, December 1955**

701. NEW PARAMOUNT LIGHTWEIGHT HORIZONTAL-MOVEMENT VISTA-VISION CAMERA
Daily, C. R.
***Journal of the SMPTE*, v. 65, no. 5, pp. 279–281, May 1956**

Double frame motion picture camera, operating in same manner as heavier duty Vista Vision, developed for use on locations which require extreme portability, weighs only 17½ lb complete with lightweight governor controlled d-c motor for normal 28 v service, and loaded 400 ft magazine; intermittent movement of Mitchell type. (*EI*, 1956)

702. OPTICAL MULTIPLEXING IN TELEVISION FILM EQUIPMENT
Lind, A. H., Melchionni, B. F.
***Journal of the SMPTE*, v. 65, no. 3, pp. 140–145, March 1956**

Basic approaches to optical multiplexing; means of providing optical mixing; description of RCA TP-11 semi-mirror and RCA TP-15 multiplexer for vidicon use, designed around moving mirror array; combinations of TV systems built around TP-15, latest in series of coaxial or "on axis" multiplexers. (*EI*, 1956)

703. PROBLEM OF AFTER-EFFECTS IN THE VIDICON
Heimann, W.
***Arkiv der Elektrischen Übertragung*, v. 10, no. 2, pp. 73–76, February 1956 (in German)**

The vidicon camera, in increasing use for industrial and also broadcasting purposes, has an excellent sensitivity and signal-to-noise performance but suffers from photo-electric inertia and afterglow due to charge storage in the Sb_2S_3 layer. Specially developed experimental techniques for measuring signal current under exclusion of the high resistance of the photo-layer is described, and families of curves are plotted showing decay characteristics for different scanned areas and for photolayers of varying thickness. Relationships between resolution, capacity layer bias potential, signal level and inertia effects are discussed next. A brief indication is given of methods of overcoming these defects, mainly by increasing the potential gradient by higher photo-sensitivity of the target and reduction of storage capacity by the use of a thicker layer. (*EEA*, 1956)

704. MINIATURE VIDICON OF HIGH SENSITIVITY
Cope, A. D.
***RCA Review*, v. 17, pp. 460–468, December 1956**

705. TRANSISTORIZED TELEVISION CAMERAS USING THE MINIATURE VIDICON
Flory, L. E., et al.
***RCA Review*, v. 17, pp. 469–502, December 1956**

706. TV EQUIPMENT PAPERS
IRE Convention Records, v. 4, Part 7, Audio and Broadcast, pp. 3–44, 87–133, 1956

Among other papers includes: 3-Vidicon Color Television Camera for Live Pickup; and Design Considerations for High-Quality Transistorized Program Amplifier for Remote Broadcast Use.

707. UN NOUVEAU TELECINEMA: LE TELECINEMA VIDICON
Tafflet, J.
Onde Électrique, v. 37, no. 364, pp. 646–649, July 1957

New television-cinema equipment: "Vidicon Telecinema": description and technical and economic advantages of system incorporating tube of vidicon type, and making possible use of 16- and 35-mm projectors with one camera. (*EI*, 1957)

708. MINIATURE ITV CAMERA USES DRIFT TRANSISTORS
Flory, L. E., Gray, G. W., Morgan, J. M., Pike, W. S.
Electronics, v. 30, no. 1, pp. 138–142, January 1, 1957

Design features of 12 transistor television camera which puts out video modulated r-f signal on either of two v-h-f channels; video amplifier stages use drift transistors to achieve 4-mc bandwidth; pickup tube is only ½-in. in diameter and 3-in. long; total camera power consumption is 5.2 watts on a-c line operation; block and circuit diagrams. (*EI*, 1957)

709. UNE CAMERA DE TELEVISION PORTABLE ET AUTONOME
Polonsky, J.
Onde Électrique, v. 37, no. 364, pp. 650–657, July 1957

Portable and entirely independent television camera; miniature camera, which through provision of portable transmitter receives its power from light batteries and transistors; successful tests by operator moving around in crowd, on board car, plane or helicopter, reception taking place at fixed point on ground. (*EI*, 1957)

710. ELECTRONIC SHUTTER FOR TELEVISION KINESCOPE RECORDER
Crocker, D. C.
Electronics, v. 30, pp. 186–187, May 1, 1957

Multivibrators and gates blank video-recording during pull-down of film and then allow the 525 lens to appear for exposure of next frame. A switch delivers a starting pulse after each film advance or 24/sec. This technique gives one complete television frame on each film frame despite frame-rate difference.

711. TRANSISTORS SYNCHRONIZE PORTABLE TV CAMERA
Kinoshita, K., Fujimura, Y., Kihara, Y., Mii, N.
Electronics, v. 30, no. 7, pp. 168–169, July 1957

Particulars of Japanese camera transmitter which uses sync generator comprising ten transistor flip-flop circuits with two feedback amplifiers to form counter unit that divides twice horizontal frequency by 525 to produce field frequency.

712. THE PROBLEM OF INERTIA EFFECTS IN TELEVISION CAMERA TUBES OF THE VIDICON TYPE
Kunze, C.
Hochfrequenztechnik und Elektroakustik, v. 66, no. 3, pp. 84–89, November 1957

Measurements show that inertia effects are mainly due to incomplete recharging of the picture elements. The dependence of these effects on operating parameters, and methods of eliminating inertia effects, such as roughening the target surface, are discussed.

713. THE TRANSIENT RESPONSE OF PHOTOCONDUCTIVE CAMERA TUBES EMPLOYING LOW-VELOCITY SCANNING
Redington, R. W.
IRE Transactions on Electron Devices, v. ED-4, no. 3, pp. 220–225, July 1957

The transient signal which results from the characteristics of a low-velocity electron beam and the capacitance of the scanned surface has been calculated. The calculations have been verified by tests on a 6198 Vidicon. Comparable contributions were made by the electronic transient and the photoconductive decay to the observed transient response.

714. THE INFLUENCE OF THE OPTICAL SYSTEM OF A TELEVISION CAMERA ON THE FREQUENCY RESPONSE OF THE TELEVISION SYSTEM
Frenzel, D.
Rundfunktechnische Mitteilungen, v. 2, no. 1, pp. 20–28, February 1958 (in German)

715. SUPER-SENSITIVE TV CAMERA TUBE
Electronics World, p. 94, August 1959

This new type literally sees in the dark without any special illumination such as infra-red.

716. A TELEVISION CAMERA WITH PROLONGED STORAGE TIME FOR TELEVISING WEAKLY ILLUMINATED OBJECTS IN PARTICULAR FOR THE APPLICATION OF TELEVISION TO ASTRONOMY
Piepereit, P.
Rundfunktechnische Mitteilungen, v. 2, no. 1, pp .18–19, February 1958 (in German)

For use in television telescope, it was necessary to have a camera with a higher degree of photosensitivity. An image orthicon with reduced storage capacity gave a rise in sensitivity that was insufficient. The following was done: A train of rectangular pulses on the control grid of the electron gun produces an adequate increase of sensitivity (the same output voltage as with ordinary scanning with only 5% of the light usually required and a storage time of one second). The increased flicker of the picture is remedied by inserting a picture monitor with a long after-glow screen and a second TV camera. (*EEA*, 1958)

717. BEAM LANDING ERRORS AND SIGNAL OUTPUT UNIFORMITY OF VIDICONS
Neuhauser, R. G., Miller, L. D.
Journal of the SMPTE, v. 67, pp. 149–153, March 1958

718. IMPROVED DEVELOPMENT ONE-INCH VIDICON FOR TELEVISION CAMERAS
Miller, L. D., Vine, B. H.
Journal of the SMPTE, v. 67, pp. 154–156, March 1958

719. SOME NEW STRUCTURE TYPE TARGETS FOR THE VIDICON: ANALYSIS OF THEIR OPERATION
Ochs, S. A., Weimer, P. K.
RCA Review, v. 19, pp. 49–61, March 1958

720. SEMICONDUCTING MATERIALS IN VIDICON TYPE TELEVISION PICKUP TUBES
Babits, V. A.
Television Society Journal, v. 8, no. 12, pp. 498–502, October–December 1958

A summary of the target materials used in the vidicon-type tube, and the physical principles underlying their performance. Possible increases in sensitivity and temperature range are suggested as a result of proper choice of material for the various layers.

721. SATELLITE EYE NEEDS TV RETINA
Electronics, v. 31, p. 8ff., May 9, 1958

A description of the work at Princeton, N. J., on an image orthicon tube with a high-gain semiconductor target that builds up charge over ½ hr before scanning, with appreciable leakage from globule to globule in the mosaic.

722. CONTRIBUTION ON THE PROBLEM OF PORTABLE TELEVISION CAMERAS FOR OUTSIDE BROADCASTS
Fix, H.
Rundfunktechnische Mitteilungen, v. 2, no. 3, pp. 120–128, June 1958

The design and application of portable television cameras are discussed, and three cameras are compared.

723. A VIDICON CAMERA FOR INDUSTRIAL COLOUR TELEVISION
James, I. L. P.
Journal of the British Institute of Radio Engineers, v. 19, no. 3, pp. 165–180, March 1959

The main features of a simultaneous color system employing three vidicons are described and signal amplifiers and line and field scanning circuits are discussed. The picture quality obtained is adequate for 625-line broadcast standards and the equipment is universally applicable for general industrial use.

724. AN IMPROVED VIDICON FOCUSING-DEFLECTION UNIT
Castleberry J., Vine, B. H.
Journal of the SMPTE, v. 68, p. 226, April 1959

The effect known as beam-landing error "porthole" in vidicon cameras is eliminated through the use of a suitable coil configuration. The axial positions of the coils are chosen so that the beam of electrons approach the target with only an axial component of velocity at all times. Exceptional signal uniformity independent of signal-electrode voltage and focus field strength is then obtained with a vidicon having a uniform photoconductor. A particular coil design and the results obtained with it are discussed.

B. Reports

725. INVESTIGATION AND EVALUATION OF PLANIGON LENS DISTORTION CHARACTERISTICS
Friedman, S. J.
February 14, 1957
Army Engineer Research and Development Laboratories
Technical Report 1472-TR
AD 137,925

After the war, 112 mapping cameras equipped with distortion-free lenses were ordered by the Air Force. The calibration data on these cameras were analyzed and evaluated by ERDL. Results of these tests are given.

726. CLOSED CIRCUIT TELEVISION SYSTEM
King, G. W.
General Precision Laboratory, Inc., Pleasantville, N. Y.
Interim Development Report, July 1–August 1, 1952, December 22, 1952 (NObsr-47341)
AD 5,617

Optical systems giving unlimited elevation angles and moderate apertures are being investigated for the camera; both step and zoom systems were examined. Components were assembled for the experimental camera which is to use a 15-mm f.5 Ektar 16-mm camera lens, the camera control unit, and the monitor which is to have a 17-in. rectangular tube.

727. RESEARCH ON LENSES
Morais, C.
1956
Instituto Nazionale Di Ottica (Italy)
AF 61(514)926
AD 139,141

This research has been directed towards lenses for aerial photography, having about 300-mm focal length and f/5 or more relative aperture with 80 deg angular field. In order to facilitate construction, only spherical surfaces are being used.

728. PHOTOGRAPHIC RECONNAISSANCE DATA RECORDING DEVICE
Librascope, Inc., Glendale, Calif.
Final Engineering Report on Data Handling Devices, October 1, 1954–April 11, 1956
AF 33(600)26739
AD 133,937

Equipment was constructed to prove the feasibility of recording data on film in English letters and Arabic numerals where data is provided by standard synchro transmission from a given system. Two units were constructed, each of which provides a means of recording synchro information and fixed data from 12 channels. Three 70-mm strike cameras were modified to allow printing of the information along the edge of each film frame. The cameras provided the time-to-plant signal to the recorder. The photographic reconnaissance-data recorder demonstrated that the selective null sampling system is feasible. (ASTIA TAB U57)

729. DEVELOPMENT OF CAMERA INSTRUMENTATION SYSTEMS FOR MISSILE-GUIDANCE RADARS AT NOTS (U)
VanBuskirk, L. F., White R. O., et al.
October 15, 1957
Naval Ordnance Test Station, China Lake, Calif.
NOTS-1862, NAVORD 5637 (Confidential)
AD 154, 552

730. FINAL PROGRESS REPORT FOR THE LIGHT-WEIGHT TELEVISION CAMERA
July 30, 1959
Radio Corporation of America, Astro-Electronic Products Division, Princeton, N.J.
JPICAM TM-8, Order No. L-21102.

The object of the program covered by this report was to build a lightweight camera for taking pictures of the back side of the Moon. AEP built a laboratory bench model, six flight models, and three monitors, all meeting JPL specifications. The camera was designed as part of a system including a tape recorder and a small transmitter. This report contains a functional description of the system, a physical and operational description of the equipment, a summary of the operating procedures and environmental tests performed, and a list of specifications.

731. **HIGH-SPEED FRAMING DISC CAMERA**
Bagley, C. H.
April 4, 1958
Stanford Research Institute, Poulter Laboratories, Palo Alto, Calif.
TR-015-58

A high-speed framing camera, designed to investigate problems requiring a time coverage of from 6 to 20 ms, has been constructed. This camera combines the short exposure times of the rotating mirror framing cameras with a rotating disc which is used as a film transport.